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# PART 1. PROJECT PURPOSE & NEED

## PROJECT PURPOSE

The purpose of the Laveen Area Drainage Master Plan (ADMP) is to quantify the extent of local flooding problems and to identify pertinent information necessary to investigate and evaluate alternative solutions to these flooding problems. Arizona Revised Statutes Title 48, Chapter 21 requires the Flood Control District of Maricopa County (FCDMC) Board of Directors to identify flood control problems and plan for the construction of facilities that will eliminate or minimize flooding problems.

There are two major objectives of the study. The first is to develop a plan to control stormwater runoff to prevent flood damage within the watershed. The second is to mitigate future potential runoff and subsequent ponding and to provide protection to properties from future 100-year flood damages.

## PROJECT NEED

Pending development has increased significantly within the watershed, creating the need to evaluate potential flooding and ponding particularly along the Maricopa Drain alignment. Area floodplain/drainage managers, developers and municipalities will be able to use this study as a basis for locating, sizing and designing future drainage facilities.

This study is expected to identify conceptual flood control features and/or measures for the study area to reduce potential damages to property or loss of life from runoff from storm events. Features or measures identified in this planning effort may be implemented together, individually or not at all, based on scheduling, funding and cost sharing.

## PROJECT PARTICIPATION

The participation of both public and private parties is an important aspect of this project. The ADMP will only be successful if these parties feel that their interests would benefit from its implementation. Therefore, the community, developers, local municipalities, County, and other agencies were encouraged to provide input and assist in collectively developing a community-based plan, capable of being implemented.

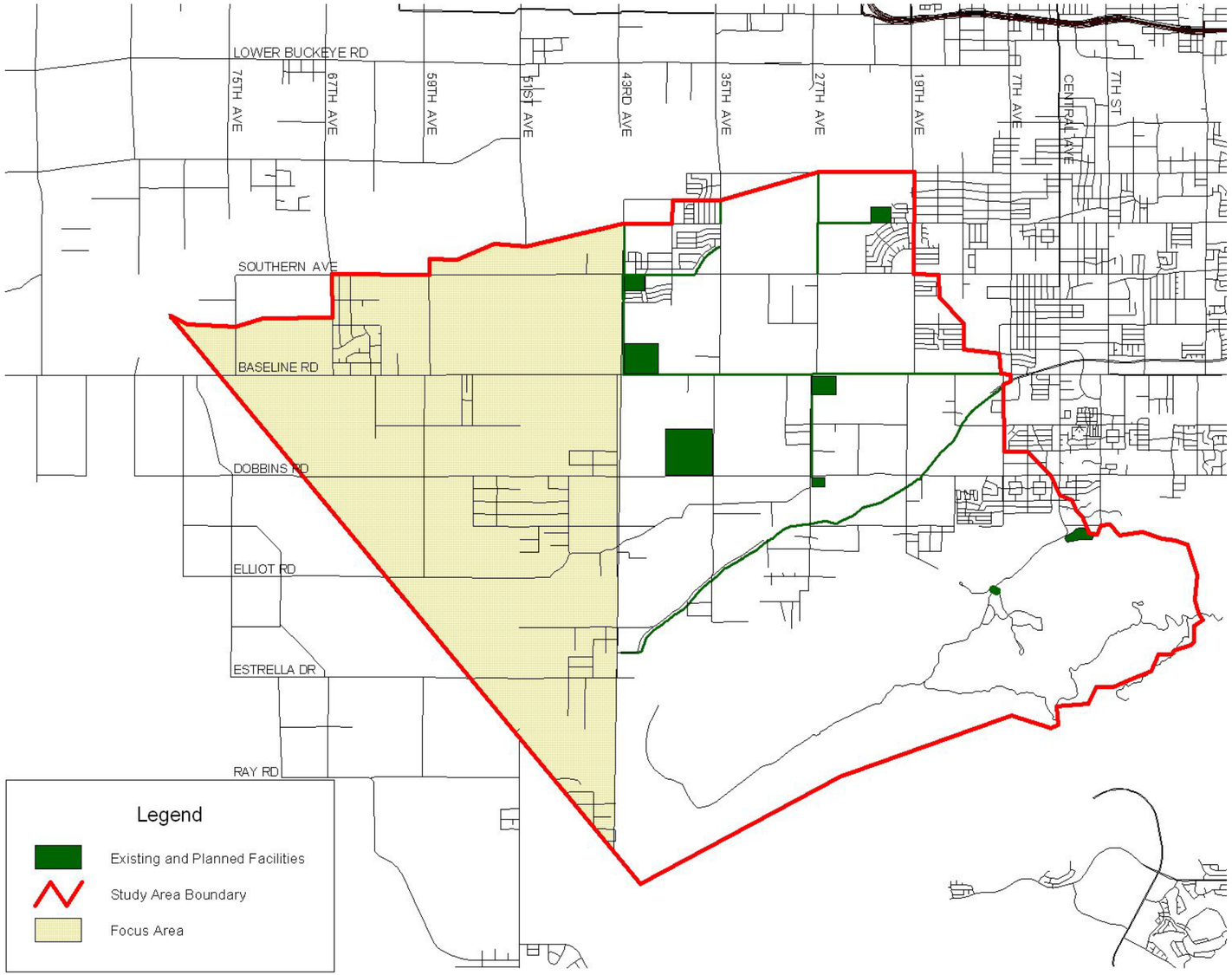



Figure 1-1: Laveen ADMP Study Area

### INTERAGENCY COORDINATION

Agencies cooperating in the preparation of the ADMP have included:

- Arizona Department of Transportation
- Gila River Indian Community
- Maricopa County Department of Transportation
- Maricopa County Planning Department
- City of Phoenix
- Salt River Project

### SPECIAL INTEREST GROUPS

In addition to governmental agencies, several special groups have cooperated in the collection of data, formulation of alternatives, and development of the preferred alternative. They include:

- Laveen Village Planning Committee
- Laveen Citizens Concerned for Growth
- Laveen School District

### PUBLIC INVOLVEMENT

Several tools have been used to assure that the general public has the opportunity to participate in the planning process. Through the use of open-house meetings, direct mailings, brochures, newsletters, and a project website (www.laveenadmp.com) the needs and desires of the community have been expressed and incorporated into the planning process.

### PROJECT OVERVIEW & HISTORY

The Laveen area has suffered numerous occurrences of flood damage during the recent past. These events have generally been the result of one of two circumstances. Either excessive amounts of stormwater have caused local ponding to elevations that inundate property, due to inadequate conveyance, or flows in the previous Maricopa Drain, the major outfall for the Laveen Area, have exceeded the capacity of the drain causing flooding.

Historically, flooding has occurred in the Laveen area causing damage to private property as was experienced by residents in July of 1999 (Figure 1-2).

Figure 1-2: July 1999 flood

Because of impending future development, the FCDMC has initiated efforts to mitigate current and future flooding potential. The Laveen Area Conveyance Channel Project (Conveyance Channel) will realign and increase the hydraulic capacity of the previous Maricopa Drain. The Conveyance Channel will be considered an existing condition for purposes of this study.

### PROJECT OVERVIEW

The FCDMC initiated this study in the fall of 2000 to develop an area drainage master plan (ADMP) for the Laveen area to identify drainage problems and develop cost-effective solutions for a storm water collection and disposal system. The scope of this effort includes public information and coordination, hydrology, hydraulics, identification of drainage problems, development of alternative solutions, and preparation of preliminary design and plans based on a preferred alternative.

### PROJECT LOCATION

The Laveen ADMP study area is located in the southwestern portion of the metropolitan Phoenix area in Maricopa County, Arizona (Figure 1-1). The 39-square mile study area is within the City of Phoenix and unincorporated Maricopa County.

The ADMP study boundaries are the Salt River on the north, approximately 7th Avenue on the east, South Mountain Park on the south, and the Gila River Indian Reservation on the west. The impact of flooding from flows in the Salt River is not covered as a part of the ADMP.

The focus area for the ADMP is the 16 square miles west of 43rd Avenue. A previous study, the Laveen Area Drainage Master Study (ADMS), included about 23 square miles of the study area west of 43rd Avenue.

### PROJECT HISTORY

Several previous studies have been conducted in the study area. These studies provided background information and also hydrologic and hydraulic models and data used in the study analyses. The studies include:

- South Phoenix/ Laveen Drainage Improvement Project (HDR Engineering, Inc., July, 1997)
- Laveen Area Master Drainage Study (Cella-Barr Associates, September, 1991)
- Laveen Land Use Plan (Maricopa County, April, 1992)
- Dysart Drain Improvement Project (The WLB Group, Inc., June 1993)
- Champion Flood Prevention RC&D Measure (FCDMC & SCS, September, 1976)

### PROJECT AUTHORIZATION

This project was authorized pursuant to a contract between the FCDMC and HDR Engineering, Inc. (HDR). The authorizing agreement is Contract FCD 2000C001 dated August 9, 2000. The FCDMC issued a notice-to-proceed to HDR on August 14, 2000. The scheduled completion date for the ADMP study is October 13, 2001.

## PART 2. EXISTING CONDITIONS ANALYSIS

The data collection efforts for developing the Existing Conditions Analysis consisted of a compilation of numerous references along with field visits in order to accurately describe the study area and identify the major features within the watershed. In addition to field reconnaissance, background information was gathered and used to develop a description of the existing conditions that will assist in the formulation of alternatives for this report. Maximum utilization of existing information was the basis for generating a comprehensive database of the existing conditions. In this section, existing facilities are identified and described, and an analysis of the area including: hydrology, natural and physical environment, geotechnical, land use, and socioeconomic characteristics is provided.

Previous reports for the Laveen/ South Phoenix area that have been referenced for this section and various sources of information were also collected to guide in the characterization of the study area. The following is a summary of the data inventory:

Hydrologic Models – The FCDMC provided the HEC-1 hydrologic computer models that were developed for the area during the design of the Laveen Area Conveyance Channel. The flood control facilities included in the model served as a basis of the significant facilities within the area. The model output was used to identify areas of flooding and to confirm the residents' flooding concerns voiced during the first public meeting and during field visits.

Historic flooding – Sources of information for historic flooding included public input, photographs, and previous reports. During field visits, residents voiced their concerns regarding areas where historic flooding had occurred. Many residents were also able to express their concerns about areas that have been affected by floods at the first Laveen ADMP Public Meeting held on November 21, 2000 in an open house format. A summary of the public comments is available in the "Public Participation" section of this report. Archived photographs from the FCDMC and the residents, previous reports, information from MCDOT, and information from SRP were also used to identify areas of historic flooding.

Topographic maps, GIS base maps – HDR acquired existing topographic maps and GIS imagery to create a representative base map of the study area containing topography, planimetric features, utilities, and other existing facilities throughout the study area. GIS information compiled included files from SRP, City of Phoenix, Arizona Department of Transportation, Arizona State Land Department, and FCDMC.

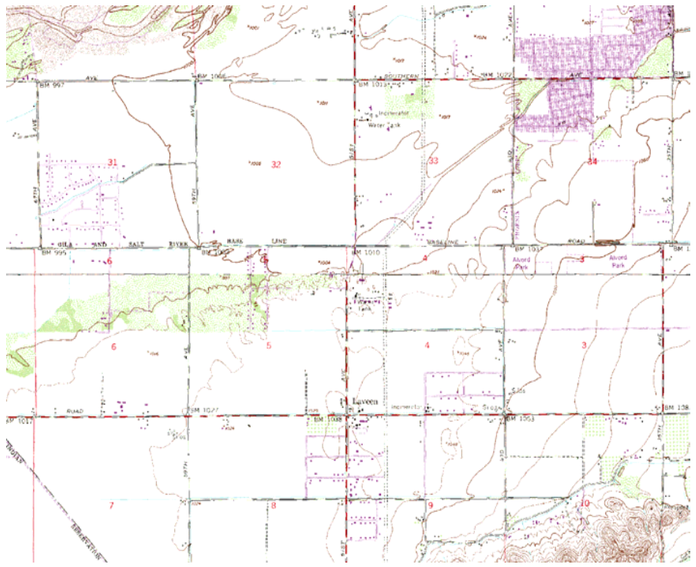


Figure 2-1: Topographic map of the Laveen ADMP study area

Floodplain Maps, CLOMRs, LOMRs – In order to develop effective flood protection measures for the Laveen ADMP, a primary data source consulted was the floodplain information developed by the Flood Emergency Management Agency (FEMA). In this case, the 100-year floodplain has been an issue of concern among many stakeholders and it was imperative that the most up-to-date information be considered for the ADMP. HDR developed a GIS database of the floodplain information and aerial imagery of the areas within the floodplain delineation. No Conditional Letters of Map Revision (CLOMRs) or Letters of Map Revision (LOMRs) have been developed for this area.

Land Use, Planning, and Zoning Information – Aerial photography, existing plans, and guidelines available from the City, County, and Laveen planning organizations were compiled for a study of land use, physical characteristics, trails, bikeways, zoning and planning. A list of the plans referenced is provided in the land use analysis portion of this section.

Census information – Socio-demographic and housing information was obtained from the US Census Bureau. Discussion of this data is incorporated in the Census tracts portion of this section and includes employment, housing, income, ethnicity, and population trends.

Utilities, Infrastructure – The City of Phoenix has an extensive database of utilities, roads, and infrastructure for incorporated and unincorporated areas in Laveen. Utility companies including El Paso Natural Gas, Salt River Project (SRP), Arizona Public Service (APS), Cox Communications, and Qwest Communications were also contacted to obtain utility maps for the area. The information provided by the City will be used in the formulation of alternatives and development of flood control measures.

As-built drawings – As-built drawings were obtained for existing facilities including many of the SRP irrigation canals. This information provides a better understanding of the facilities in the area and will be used to further enhance the existing facility database. Construction drawings for the Laveen Area Conveyance Channel were also obtained for this same purpose.

Environmental and Cultural Resource Information – A literature search of existing environmental and cultural resource sites was performed and evaluated in this section. Preservation of sensitive biological and cultural areas will be a significant factor in evaluating the alternatives to be developed further in the study process. Thus, regulatory procedures and possible scenarios were evaluated during the development of these overviews. Because the previous Laveen Area Drainage Master Study evaluated the study area east of 43rd Avenue, the environmental and cultural overviews in this section are concentrated on a "focus study area" located west of 43rd Avenue. Existing information was obtained from the US Fish and Wildlife Service (USFWS) list of federally protected species, Arizona Game and Fish Department (AGFD), US Geological Survey (USGS), and a field investigation. No species–specific surveys were conducted as part of this evaluation.

Geotechnical Information – Research activities were performed and information was gathered from several sources including US Department of Agriculture, Soil Conservation Service (SCS), Arizona Department of Water Resources (ADWR), and USGS. Characterization of the focus area resulting from this analysis will aid in the development of future alternatives appropriate for the topography, geology, groundwater, and surface and near-surface soil and rock conditions.

## HYDROLOGY

### *Watershed Description*

The Laveen ADMP area is located in the southwestern portion of the metropolitan Phoenix area. The Salt River, 7th Avenue, South Mountain Park, and the Gila River Indian Reservation bound the 39-square mile study area in unincorporated Maricopa County and the City of Phoenix. Figure 2-3 shows the study boundary, existing and future improvements, and flooded areas.

The ADMP area is divided into three distinct drainage watersheds, the Maricopa Drain Watershed, the Hidden Valley Watershed, and the Southwest South Mountain Watershed. The largest watershed, the Maricopa Drain Watershed, is further divided into two parts based on the FCDMC decision to develop a separate drainage improvement plan for the upstream, more developed portion of the area. Detailed descriptions of each watershed as well as maps of each are included in this section.

### *Development of Hydrology*

*Laveen Area Drainage Master Study*

The FCDMC began studying the Laveen area in 1989 with the development of the Laveen ADMS. The details of the study are found in "Laveen Area Master Drainage Study, Phase I, Hydrology Report, Existing Conditions." This study identified the drainage features of the area and developed the hydrology used to predict the magnitude of flooding probable in the Laveen area. The study indicated the extent of flooding to allow for a floodplain delineation. The floodplain delineation revealed a very large floodplain at the former Maricopa Drain location. The hydraulics for this area are detailed in the report "Laveen Area Master Drainage Study, Phase I, Hydraulic Report." These results were not well received by the residents of the area. The delineation and hydrologic modeling was completed according to FEMA criteria. Subsequent to the delineation, the FCDMC remodeled the storm water runoff taking into account all the physical features in the watershed. This remodeling reduced the floodplain width. Neither study has been adopted or sent for inclusion into the National Flood Insurance Program.

*South Phoenix/Laveen Drainage Improvement Project*

In 1995, the FCDMC initiated the South Phoenix/Laveen Drainage Improvement Project with HDR as the study contractor. This project is detailed in the report titled "Preliminary Design Report for the South Phoenix/Laveen Area."

The goal of this project was to develop flood control features to provide flood protection for the residents of the South Phoenix/Laveen area between Central Avenue and 43rd Avenue, from South Mountain Park to the Salt River. The HEC-1 computer model developed in 1991 was used as the basis for the hydrology for the South Phoenix/Laveen ADMS. The 1991 existing conditions model was based on the existing condition 100-year, 24-hour storm event. This model used the Green and AMPT Loss Rate, Clark Unit Hydrograph, and Normal Depth and Modified Puls Routing procedures. The approach HDR used in revising the 1991 model was to use the model parameters as much as was practical in the development of the new sub-area parameters. Since the results of the 1991 study had been accepted by the FCDMC, drastic changes to the model and modeling results were deemed unacceptable.

The results of this drainage improvement project, which can be seen in Figure 2-3, included the recommendation of the following projects for flood mitigation:

- Storm Drain on 7th Avenue from South Mountain Park to Baseline Road
- Storm Drain on Baseline Road from 7th Avenue to 43rd Avenue (MCDOT beginning construction)
- Storm Drain on 43rd Avenue from Baseline Road to the Salt River (installed by FCDMC project)

Figure 2-2: 43rd Avenue storm drain being installed

- Storm Drain on 27th Avenue from Dobbins Road to Baseline Road
- Storm Drain from Southern Avenue to the Salt River
- Detention Basin at 27th Avenue and Dobbins Road
- Detention Basin at 27th Avenue and Baseline Road
- Detention Basin near Lindo Park (23rd Avenue & Roeser)
- Detention Basin at Dobbins Road and 35th Avenue (contained within the Aguila Golf Course)
- Detention Basin at 43rd Avenue and Southern Avenue (currently under FCDMC design)
- Detention Basin at 43rd Avenue and Baseline Road (added after project)

*Laveen Area Drainage Master Plan*

The original hydrology models will be used as the existing conditions models for the Laveen ADMP. Since the conclusion of the South Phoenix/Laveen Drainage Improvement Project, the FCDMC has made modifications to the Maricopa Drain Watershed hydrology model to update it for flood control features constructed in the watershed. Most of these features were identified in the previous drainage improvement project. Several of these features are not yet "existing" but it is anticipated that they will be completed when this ADMP is concluded. The ADMP will be developed as if they were complete.

### *Existing Condition Hydrology Models for this Study*

The ADMP area is divided into three distinct drainage watersheds with unique HEC-1 hydrologic models. The three watersheds are the Maricopa Drain Watershed (LB2D.DAT), the Hidden Valley Watershed (HDNVLLY.DAT), and the Southwest South Mountain Watershed (SWSM24.DAT). The HEC-1 input and portions of the output are in Appendix A.

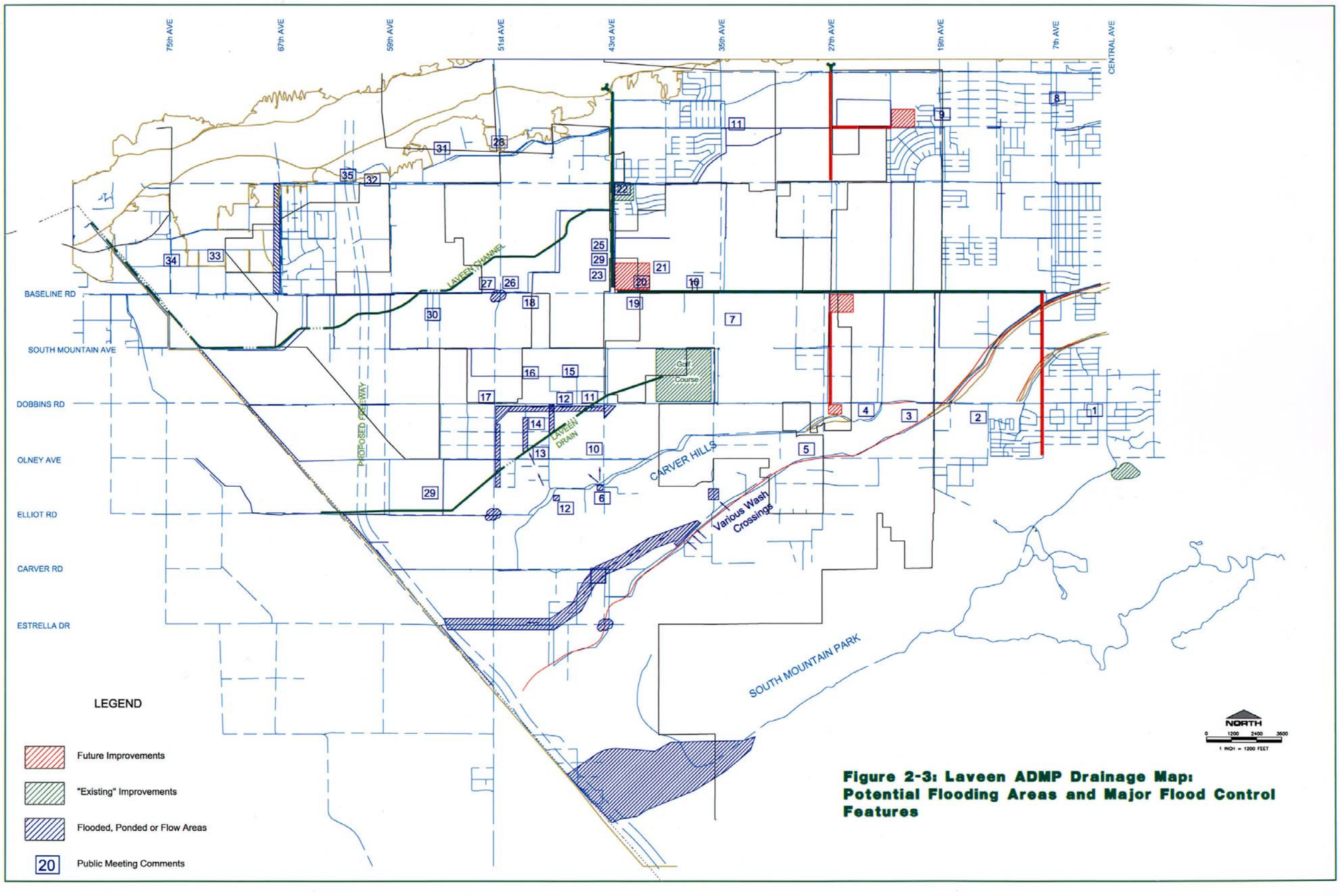



**Figure 2-3: Laveen ADMP Drainage Map: Potential Flooding Areas and Major Flood Control Features**

*Maricopa Drain Watershed*

The Maricopa Drain Watershed, originally called the Champion Drain Watershed, remains much the same as in the original ADMS. More than 80% of the ADMP area is included in the Maricopa Drain watershed. Totaling nearly 32 square miles, the area includes sub-basins in the desert mountain area of South Mountain, large agricultural areas, rural residential areas (including small ranches and family farms), and more urbanized higher density developments. Drainage patterns show that storm water runoff flow will travel from the southeast to the northwest, or from South Mountain Park to the Salt River. The Maricopa Drain intercepts most of the runoff in the area.

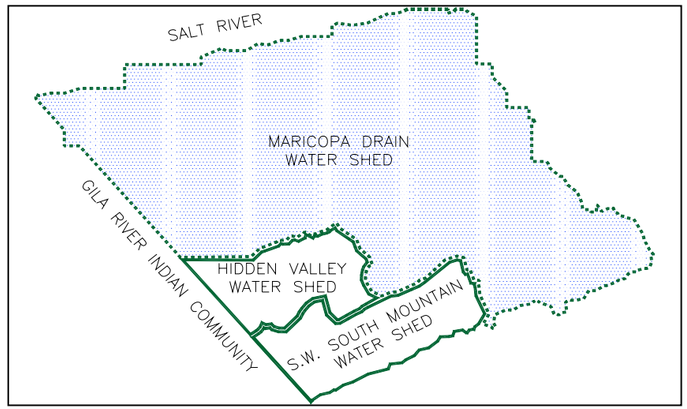



Figure 2-4: Maricopa Drain Watershed

Several changes have been made to the model over the years. For the purposes of this ADMP, five sub-basins formerly in the Hidden Valley watershed model are now included in the Maricopa Drain Watershed because a portion of the flow from this area contributes to the Laveen Area Conveyance Channel. The model has been modified by the inclusion of some features of the South Phoenix/Laveen Drainage Improvement Project. These basins are included because they contribute runoff to the Maricopa Drain. The model includes features of the plan that have already been constructed or are in the process of design and construction as well as minor modifications that have developed during the last 10 years. These features, many of which were identified in the drainage improvement project, include the storm water retention features in Aguila Golf Course at 27th Avenue and Dobbins, the Baseline Road Storm Drain from 7th Avenue to 43rd Avenue, the 43rd Avenue storm drain outfall to the Salt River, the storm water detention basin at 43rd Avenue and Southern, and the new Laveen Area Conveyance Channel from 43rd Avenue to the Salt River. The FCDMC is currently preparing documentation for the changes made in the interim since the drainage improvement project. Changes were incorporated into the model to more closely resemble the actual behavior of storm water flows (i.e. – routing reaches were made to flow at a more reasonable velocity, etc.).

Appendix B shows the various sub-basins, flow patterns and the flow rates at various locations within the Maricopa Drain Watershed. These flow rates will be considered the existing conditions for the phases that follow in developing this ADMP.

*Hidden Valley Watershed*

Figure 2-5: Carver Hills

The Hidden Valley watershed is located on the west end of the study area between the Gila River Indian Reservation and South Mountain Park. Hidden Valley is nestled between South Mountain and Carver Mountain and has natural ground slopes to the west. Runoff is conveyed to the west and eventually onto the eventually onto the Reservation.

Totaling nearly three square miles, the area includes sub-basins in the desert mountain areas of South Mountain and Carver Mountain, large agricultural areas, rural residential areas (including small ranches and family farms), and almost no higher density developments.

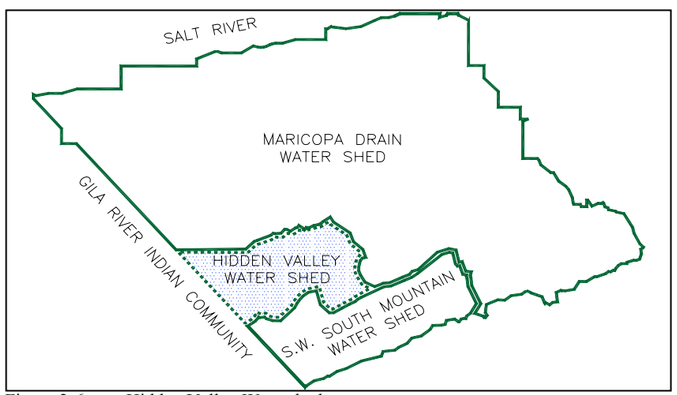



Figure 2-6: Hidden Valley Watershed

*Southwest South Mountain Watershed*

At the southwest part of the ADMP area is the Southwest South Mountain Watershed. This watershed is uniquely different from the other watersheds. It is nearly 100% desert mountain and hill slope runoff. The drainage area is slightly more than four square miles in area. The area extends to the east and is adjacent to the uppermost portions of the Maricopa Drain Watershed. The flow is generally to the west following San Juan Road in Phoenix's South Mountain Park. The westernmost edge is developed, mostly with large lots and desert/natural landscape. Runoff from area sub-basins does not combine, but is instead conveyed out of the ADMP area across the Reservation boundary through sheet flow or in small channels. The area appears to be alluvial and has the appearance of a fan in some locations.

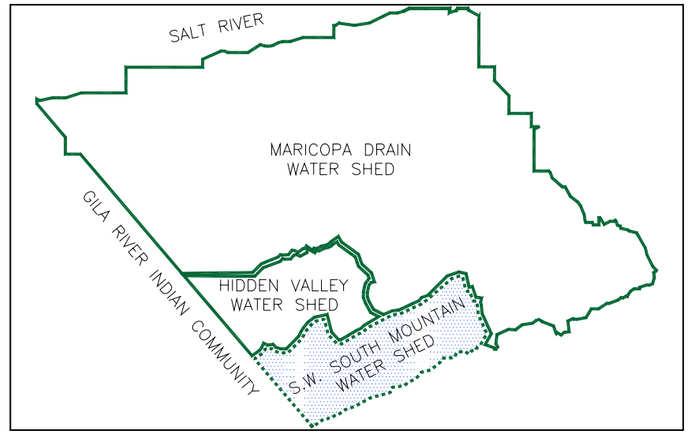



Figure 2-7: Southwest South Mountain Watershed

***Existing Flooded Areas***

In addition to the flooding of the Maricopa Drain alignment predicted by the original Laveen ADMS, there are other locations within the Laveen ADMP area that are known to have significant flooding problems, and still other locations where flooding has the potential to do harm. A search of public documents showing the location of historic flooding locations did not produce significant results. Possible explanations are that the area is largely agricultural in nature and the flooding that does occur is in locations where homes and personal property are not affected.

The Maricopa County Department of Transportation (MCDOT) did produce some documentation of street floodings in the Laveen area. The information from the Records Administration was added to the Laveen ADMP drainage map. A copy of the Records obtained can be seen in Appendix C.

At the Laveen ADMP first public meeting several residents noted that there were past flooding problems that concerned them in the Laveen area. One resident provided videotapes of three separate events that flooded his house. Another resident provided photos of a flooding event in their neighborhood.

Other locations of potential flooding were identified using the results of the hydrologic models developed for the ADMS. Areas of large, concentrated flow or large values of sheet flow predict that flooding is probable for the 100-year event.

Field investigations confirmed existing areas that may also be of concern. Among these areas, the Laveen Elementary School, located on 51st Avenue and Dobbins Road, was pointed out repeatedly by residents and school officials. During a storm event in 1999, the school experienced damage to various classrooms. Several causes can be attributed to the flooding in the school. Figure 2-8 shows an irrigation ditch between the Laveen Elementary School and a sub-division east of the shool. The ditch has created a dam where stormwater flowing from the east towards 51st Avenue collects.

Figure 2-8: Irrigation Ditch between Laveen Elementary School and a sub-division located east

Residents reported that they had to breach the canal in the past to relieve the ponded stormwater around homes in the area. This, however allows the water to flow onto the school or private property to the west.

Another cause that may significantly contribute to the flooding at the Laveen Elementary School follows a line of flooding patterns along Dobbins Road. Shown on the left foreground of Figure 2-9 is an

Figure 2-9: Elevated Headwall of an Irrigation Ditch located at 43rd Avenue and Dobbins Road

elevated irrigation ditch located along the north side of Dobbins Road, at 43rd Avenue, that causes flows to be contained on the south side of the road flowing westerly. Further along Dobbins Road, near 47th Avenue, the elevation of the road and the irrigation ditch on the north side help to form a swale along the south side of the road causing storm runoff to be directed west. This can be observed in Figure 2-10. As a result, storm water flows to the west into a subdivision beyond 47th Avenue where residents have complained of flooding recently. Following this same pattern, storm water continues to flow west towards the Laveen Elementary School.

Figure 2-10: Looking west along the south side of Dobbins Road near 47th Avenue

Figure 2-11 shows the elevated road, the elevated canal, and the school in the background.


Figure 2-11: Looking west on the south side of Dobbins Road showing the elevation of the road, the elevated canal, and Laveen Elementary School

During the same storm event in July of 1999, the intersection of Steinway Drive just south of Dobbins Road and 51st Avenue also experienced flooding (see Figure 2-12).


Figure 2-12: Intersection of 51st Avenue and Dobbins after storm event in July of 1999

Flooding occurs along 51st Avenue south of Dobbins Road and within the sub-division to the east of 51st Avenue. As seen in Figures 2-13 and 2-14, the area southeast of Dobbins Road and 51st Avenue became flooded during this event and water flowed into yards and homes.

Figure 2-13: Flooded yard located in the southeast quadrant of 51st Avenue and Dobbins Road after July 1999 storm event

Figure 2-14: Flooded home located in the southeast quadrant of 51st Avenue and Dobbins Road after July 1999 storm event

Additional areas of potential flooding were also observed. One such area is shown in Figure 2-15.

Figure 2-15: Canal south of Dobbins along 49th Avenue alignment

A canal is located approximately on the 49th Avenue alignment, just south of Dobbins Road. It continues south for several hundred feet and blocks the stormwater in that area.

Figure 2-16 shows an area located at 67th Avenue between Baseline Road and Southern Avenue. This area is depressed from adjacent lands creating a potential for flooding.


Figure 2-16: 67th Avenue between Baseline Road and Southern Avenue

Along Carver Road, at the Western Canal, there are several locations where overchutes are provided for storm water conveyance across the canal. These locations cause flooding and maintenance problems along the roadway. In addition, runoff from Carver Hills and parts of South Mountain flow to an un-named wash just north of Carver Road. This runoff eventually reaches the wash and is conveyed west to the Carver Road crossing as seen in Figure 2-17. Consequently, homes downstream of the Carver Road Wash crossing have been bermed to prevent flooding. There is no apparent wash on the south side of Carver Road.

Figure 2-17: Wash approaching Carver Road crossing

Figure 2-18: 47th Avenue and Estrella Road

Additional flooding problems caused by this wash can be observed at the intersection of Estrella Road and 47th Avenue (see Figure 2-18).

Storm water flows from the wash and from other areas in Hidden Valley towards Estrella Road at 47th Avenue. From this location, flows generally follow Estrella Road to the west towards the Gila River Indian Reservation.

East of 51st Avenue, also on Estrella Road, there is a swale on the north side of the road and a large dirt ditch on the south side. On the west side of 51st Avenue, the ditch switches north of Estrella Road and continues to the Reservation. There is evidence in Figure 2-19 that the capacity of this culvert crossing at 51st Avenue is sometimes exceeded and flows escape the canal to the north side of the road. This adds to the ponding that occurs on the east side of 51st Avenue.

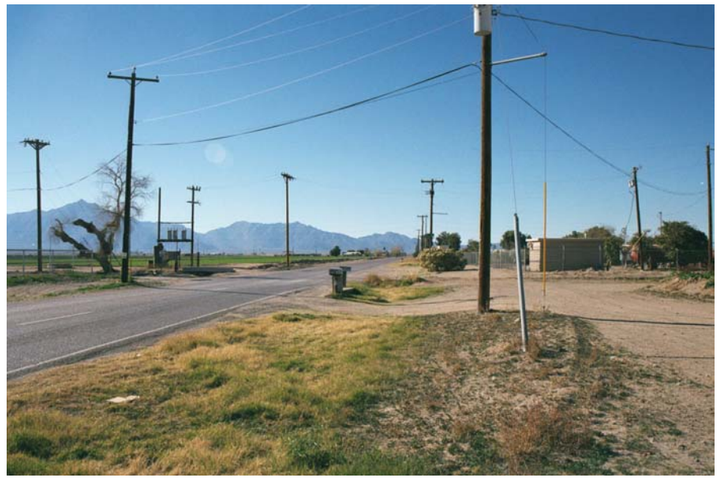


Figure 2-19: Estrella Road east of 51st Avenue

A major feature observed during field investigations is located within the Southwest South Mountain watershed. A large portion of the watershed is made up of an alluvial fan from the South Mountains with some dispersed development (see Figure 2-20). The FCDMC is monitoring the fan as a study project and has several structures in place within the park area to monitor changes in the fan.

Figure 2-20: Alluvial fan from the South Mountains

Development in the area attempts to work around the existing drainage features and washes as observed in Figure 2-21.

Figure 2-21: Development surrounding flood control features within the Southwest South Mountain watershed

Figure 2-3 shows the various watersheds, flood control features, drainage paths, and known or potential flooding areas. Also included (denoted by the numbers) are the comments made by residents of the area who attended the first Laveen ADMP public meeting.

### *Hydrology Summary*

In 1989, a District Area Drainage Master Study was performed that identified several locations where flooding was severe or problematic. The results from that report were developed into a drainage improvement project in the eastern half of the Laveen study area. Those projects provided drainage solutions where floodwaters could be collected, controlled, and conveyed offsite. Projects included basins, storm drains, and a pump station in the area east of 43rd Avenue. This current ADMP hydrologic study effort presents the results of updating flood control hydrology to complete the plan in the west half of the study area. The hydrologic models have been updated to include changes to the present date in the watershed.

The west half of the study area includes three separate watersheds. They are: the Maricopa Drain Watershed (this includes the South Phoenix/Laveen DIP section and the Laveen Area Conveyance Channel section), the Hidden Valley Watershed, and the Southwest South Mountain Watershed. Information has been collected from various sources and mapped to determine the severity and extent of the flooding areas within the project boundary. This information has been documented, and correlates well with the results of the hydrologic models.

## PUBLIC PARTICIPATION

Community members also contributed to the Data Collection phase of this ADMP. As the field visits were taking place, residents from the area spoke to many of the ADMP engineers, planners, and scientists. Each interaction contributed to the understanding of the Laveen area. Residents provided photographs and videos and described their experiences while living in the area. Most of this information corroborated the findings from the hydrologic models and locations where flooding occurs.

The first Laveen ADMP Open House meeting was held on November 21, 2000 at the Laveen Elementary School. Attendance consisted of community members, public officers, representatives from the agencies involved with the Laveen Improvement Project (FCDMC and City of Phoenix), and consultants working on the ADMP.

The meeting provided a setting where members of the community could learn more about the ADMP and contribute to the Data Collection effort. It was an opportunity for many to voice their specific concerns and address their comments. This was facilitated by the use of interactive maps where attendees could write and comment on flooding areas within a specific location. A summary map is shown in Figure 2-3. The number denotes comments addressed at the meeting.

Table 1: Summary of Public Comments presented at the Laveen ADMP Open House (numbers correspond to Figure 2-3).

| Number | Comment |
|---|---|
| 1. | Dobbins floods from Central |
| 2. | Animal shelter (15 acres) |
| 3. | People have driven off road into canal |
| 4. | Road floods (very low area) |
| 5. | Irrigation canal |
| 6. | Irrigation canal |
| 7. | 30 Acre housing development<br>Perforated underground drain (can't build on top of it) |
| 8. | Bridge |
| 9. | Bridge |
| 10. | Open ditches dangerous |
| 11. | Bridge |
| 12. | Water breaks out here from wash |
| 13. | Flooded homes in 1989 |
| 14. | 47th Avenue flood problems – ditch dead ends at La Mirada Road |
| 15. | Irrigation ditch overflows to south |
| 16. | Dobbins flooded last year {1999} 8" – 16" from 47th to 51st |
| 17. | School flooded last year {1999} reference Frank Grimes |
| 18. | (Duplicate) SRP Cistern drains (this one just put in) |
| 19. | (Don't know where this one is) |
| 20. | (Duplicate) Homes along Dobbins flooded up to door last year {1999} |
| 21. | Water 2' deep in pasture (behind homes) {south of Dobbins, east of 47th} |
| 22. | Grade drops about 30" |
| 23. | 15 Ac. Basin @ 43rd and Baseline NEC |
| 24. | Area floods when it rains |
| 25. | Homes going in here now |
| 26. | Sewer lift station |
| 27. | River used to run out 43rd and Baseline |
| 28. | Possible cave in/sinkhole NWC 43rd and Baseline |
| 29. | Geographical fault |
| 30. | River used to run across 51st Ave. and Baseline |
| 31. | Future commercial |
| 32. | Only bridge for people to west |
| 33. | SRP perforated underground drain |
| 34. | Standing water area |
| 35. | Elliot's River Walk |
| 36. | 202 @ 61st Ave (currently) |
| 37. | Water about 5 to 6' deep across this area |
| 38. | Sewage lift station |
| 39. | No? Bridge. |

Table 1 summarizes these comments and includes the corresponding number. Figure 2-3 also represents areas of localized flooding as demonstrated by hydrologic models. As can be observed, many areas of local flooding coincide with public comments.

The Laveen ADMP website (www.laveenadmp.com) has been developed to provide the public information on the study including schedules, locations, maps, reports, summaries, and contacts. This website is continuously updated providing the latest developments on the ADMP.

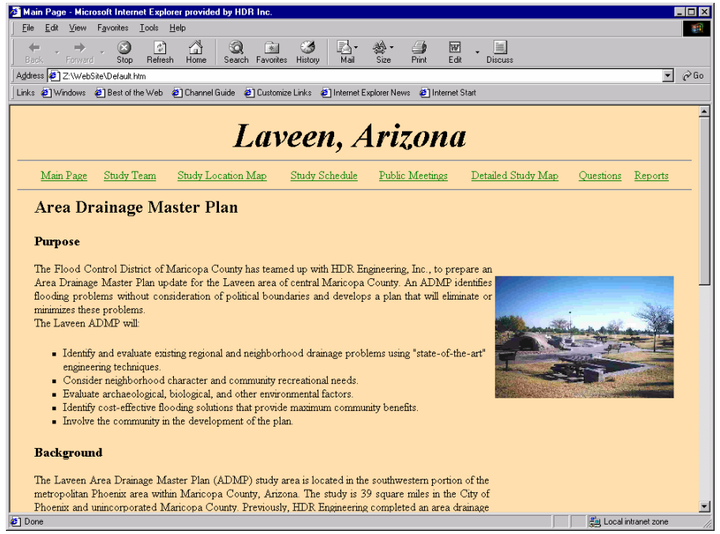



Figure 2-22: Laveen ADMP Website

### *Public Participation Summary*

Public involvement is an integral part of this study and was a primary source of information for the existing conditions analysis. Residents were approached during field visits and they were able to voice their concerns about previously flooded areas and potentially flooded areas. The Laveen ADMP first public meeting was held on November 21, 2000 in an open house format. Residents pointed out problem areas and previously flooded areas on a map. These are of potential flooding were verified with hydrologic model output and they seem to converge. They can be seen in Figure 2-3.

Additional Public Meetings were held throughout the process and are discussed in the corresponding sections of the report. The second Public Open House was held on February 20, 2001 as part of the Alternatives Formulation process of the ADMP. This meeting was organized in a series of stations showing each alternative.

The third public Open House was conducted on June 5, 2001. This meeting was part of the Alternatives Analysis Portion of the ADMP. It consisted of two segments: a 15-minute informational session providing an overview of the ADMP process, and several stations showing the conceptual engineering and landscape plans for each of the alternatives in this portion of the study.

The final Public Meeting was held on October 1, 2001 and was part of the Recommended Plan. This meeting was a formal presentation that provided an overview of the complete process and of the recommended plan. A question and answer session followed the presentation.

Project information is continuously updated and posted on the official study website, www.laveenadmp.com.

## EXISTING FACILITIES

Located within the Laveen ADMP study area are several major canals that may contribute in some way to surface drainage. Figure 2-23 shows the location of these facilities.

### *Laveen Area Conveyance Channel*

The Laveen Conveyance Channel Project is a result of the joint efforts between FCDMC, City of Phoenix, and individual owners to provide flood control protection and relief to the Laveen area. It is expected to be constructed in 2001/2002/2003. The purpose of the channel was to provide flood protection for the area bounded by the Salt River on the north, the Gila River Indian Reservation on the west, South Mountain Park on the south, and 43rd Avenue on the east.

The channel begins on the upstream end at 43rd Avenue one-half mile south of Southern Avenue (Vineyard Road) and flows southwesterly to 59th Avenue where it crosses Baseline Road. The channel continues southwesterly to 67th Avenue where it meets South Mountain Avenue, one-half mile south of Baseline Road and continues due west parallel to South Mountain Avenue to the powerline alignment one-quarter mile west of 75th Avenue. The conveyance channel then parallels the powerline alignment to the northwest to the Salt River, which is the outfall for the storm flows. The length of the channel is 30,911 feet or 5.85 miles. The channel cross-sections vary to a minor degree throughout the reaches. The average width of the channel corridor is 200 feet (see Figure 2-24), with a depth varying from 5½ feet to 8 feet, and 5:1 side slopes. Differing sections with retaining walls are present where adjustments have been made to accommodate the powerline corridor.

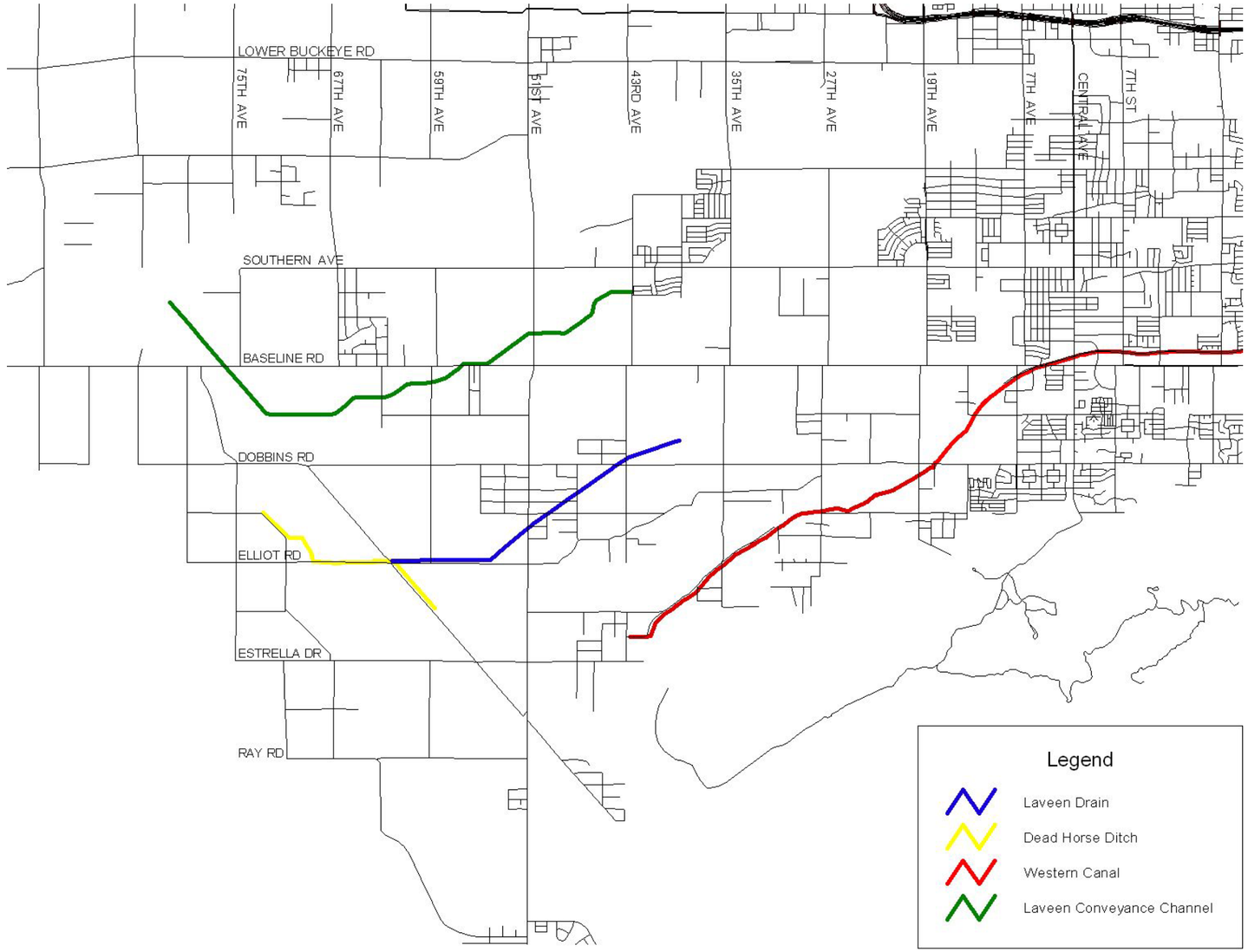



Figure 2-23: Major Existing facilities within the Laveen ADMP study area

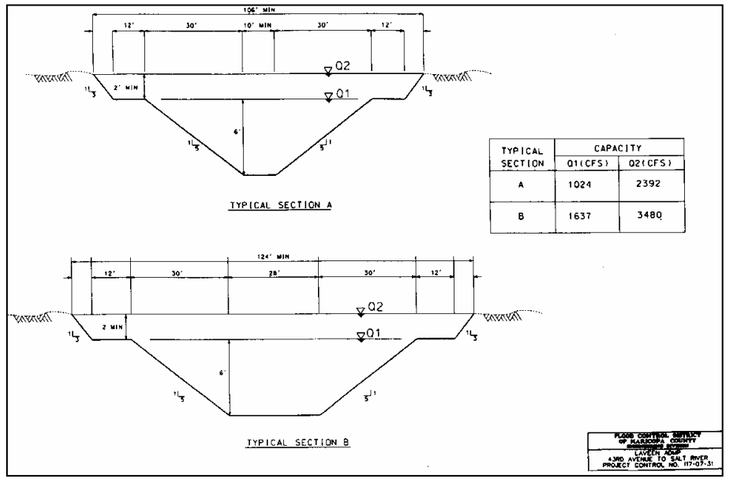



Figure 2-24: Laveen Area Conveyance Channel Cross-section

The capacity of the channel ranges from a maximum of 1,900 cfs at the upstream end to a final capacity of 34,000 cfs at the downstream end at the outfall. Within the channel there is a low-flow channel that is maintained to deliver irrigation water to the Gila River Indian Reservation. The low-flow channel was designed to allow a nominal flow of 10 cfs to the Gila River Indian Reservation with a peak capacity of 20 cfs. The source of water for these deliveries is a pump currently being used by SRP for deliveries to the Gila River Indian Reservation.

Agricultural flows from irrigation tailwater are also being collected from the surrounding flood irrigation farm fields and will continue to be conveyed to the channel until the area is fully developed.

The Laveen Area Conveyance Channel takes advantage of the 200-foot corridor to provide for multi-use amenities and recreational facilities while enhancing the landscape and aesthetic character of the channel (see Figure 2-25).

***Western Canal***

The Western Canal is a 13.6-mile structure located in the southeastern portion of the ADMP study boundary along the South Mountain foothills. The canal went into operation in 1913. It is a trapezoidal concrete channel managed and operated by SRP. The Western canal is the primary outfall for the southern area between Carver Hills and South Mountain Park.

The canal runs southwesterly near 7th Avenue and Baseline Road towards 43rd Avenue and Estrella Drive. The structure accepts or impedes some stormwater flows from the surrounding area creating some impoundment of water behind it.

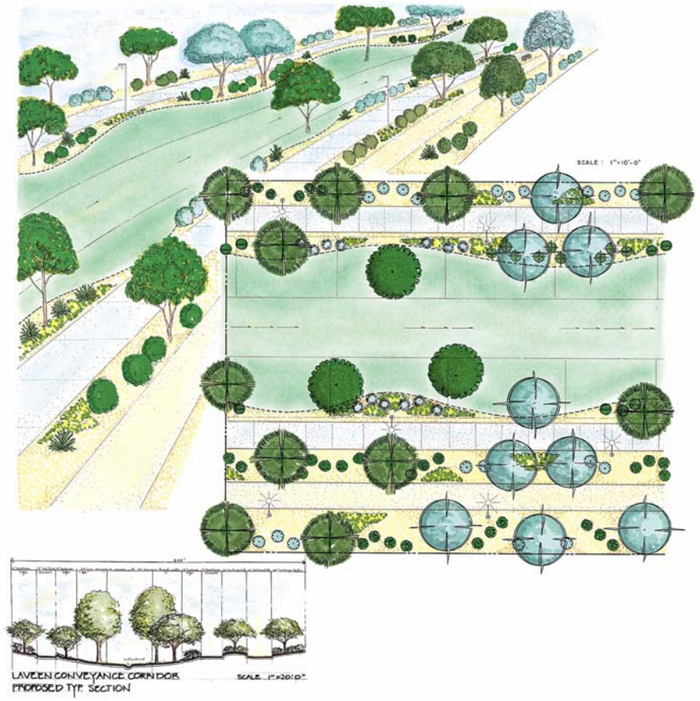



Figure 2-25: Laveen Area Conveyance Channel Multi-use Facilities

Figure 2-26: Western Canal

The actual irrigation laterals that lie within the focus area are laterals 12.8 and 14.0 in the SRP system. These laterals deliver water from the Western Canal to the areas surrounding Carver Mountain, including the area called “Telegraph Pass”. Both are trapezoidal concrete ditches typically elevated for delivery of water to the surrounding land creating a barrier to the storm flows. Numerous culverts have been installed to bypass this storm water and appear to have been in service for decades.

The SRP lateral system will affect local flow patterns if the canals are tiled when roadways are constructed, as is typically done. For the purpose of this ADMP the existing open channel lateral is considered in-place.

***Dead Horse Ditch***

Dead Horse Ditch is an earthen channel that parallels the Gila River Indian Reservation boundary/power-line corridor west of Carver Hills. It runs northwesterly from 51st Avenue one-half mile south of Estrella Drive up to Elliot Road where it turns and proceeds westerly onto the Gila River Indian Reservation.

The ditch is a historical agricultural tailwater conveyance channel that also drains the Telegraph Pass area and the southwest portion of Carver Mountain. While the flows in the ditch may be utilized for irrigation, there is no known delivery requirement for irrigation flows. The ditch appears to have also been a natural collector for storm waters. However, its capacity is insufficient to convey significant storm flows.

Figure 2-27: Dead Horse Ditch

### *Laveen Drain*

The Laveen Drain is a subsurface pipeline installed to drain the upper soils to allow agricultural fields to be farmed. The drain was installed in the 1920's and is a solid pipe (clay and concrete) with open joints that allow water to infiltrate and be transported downstream to Dead Horse Ditch. The pipeline was not intended as a storm water amenity and at best assists in draining the saturated fields.

The Laveen Drain varies in diameter from 10 inches to 18 inches. Beginning near Chavez Park at 43rd Avenue and Dobbins Road, it proceeds southwesterly to 55th Avenue just north of Elliot Road and turns westerly, ultimately outflowing into Dead Horse Ditch.

### *Salt River*

The Salt River is the ultimate outfall for the Laveen study area, as well as a major portion of the Salt River Valley. The Laveen Area Conveyance Channel outfalls into the Salt River at approximately the 81st Avenue alignment. The 3400 cfs that flows from the channel to the river is minor compared to the 100-year capacity of 164,000 cfs, as reported by the US Army Corps of Engineers. Reported watershed flows have since been reduced with the expansion of Roosevelt Dam. The flows in the river are the combination of other city outfalls and the areas that drain to the Salt and Verde Rivers downstream of Granite Reef Dam. Flooding problems caused by river backflows are not analyzed in this study, but public feedback within the whole study area has been incorporated into the data collection.

Within the study area, the river is a channel with rough grading of the rock and sands that are the major constituents of its bed. The natural grade of the river is significantly lower than the study area as can be seen by the floodplain map (see Figure 2-28).

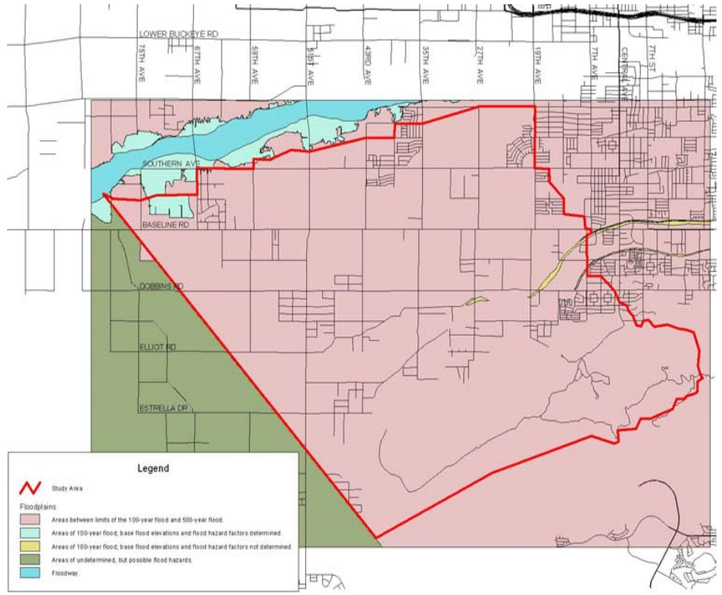



Figure 2-28: Laveen ADMP floodplain map

The river channel is disturbed with low-flow road crossings, and industrial activities such as sand and gravel operations. Vegetation along the riverbed and channel edges consists primarily of small diameter salt cedar. Other vegetation includes brittlebush, desert broom, palo verde, and other grasses.

### *Existing Facilities Summary*

The major drainage features within the study area include the Laveen Area Conveyance Channel, the Salt River, and the SRP irrigation system. The Laveen Area Conveyance Channel flows from 43rd Avenue and continues west, eventually outfalling to the Salt River at approximately 81st Avenue. This facility is the ultimate outfall for major portion of the study area and is a planned multi-use corridor.

The SRP irrigation canals have served as stormwater conveyance facilities throughout the Laveen ADMP study area, although this was never intended in their original design. Among the major irrigation facilities, the Western Canal, Dead Horse Ditch, and the Laveen Drain can be pointed out as major features that influence overall storm drainage. The Western Canal, located in the southern portion of the study area, has two major laterals that provide irrigation delivery to neighboring agricultural fields. Dead Horse Ditch is an open earthen channel that collects agricultural drain water and storm flows along the western boundary of the study area and conveys them westward onto the Gila River Indian Reservation. The Laveen Drain is a subsurface pipeline intended to drain perched water from farmlands located around 43rd Avenue near Chavez Park to Dead Horse Ditch.

Typically, as development occurs in SRP service areas, delivery ditches and minor laterals will be rebuilt as closed conduits, rather than remain as open channels. Therefore, their significance in directing local storm drainage will be removed. The major open channel facilities, in this case the Western Canal and Dead Horse Ditch, will likely remain as permanent open-channel facilities. It is possible, however, that they may be resized or reconfigured to compliment development needs.

## VEHICULAR/ MODAL

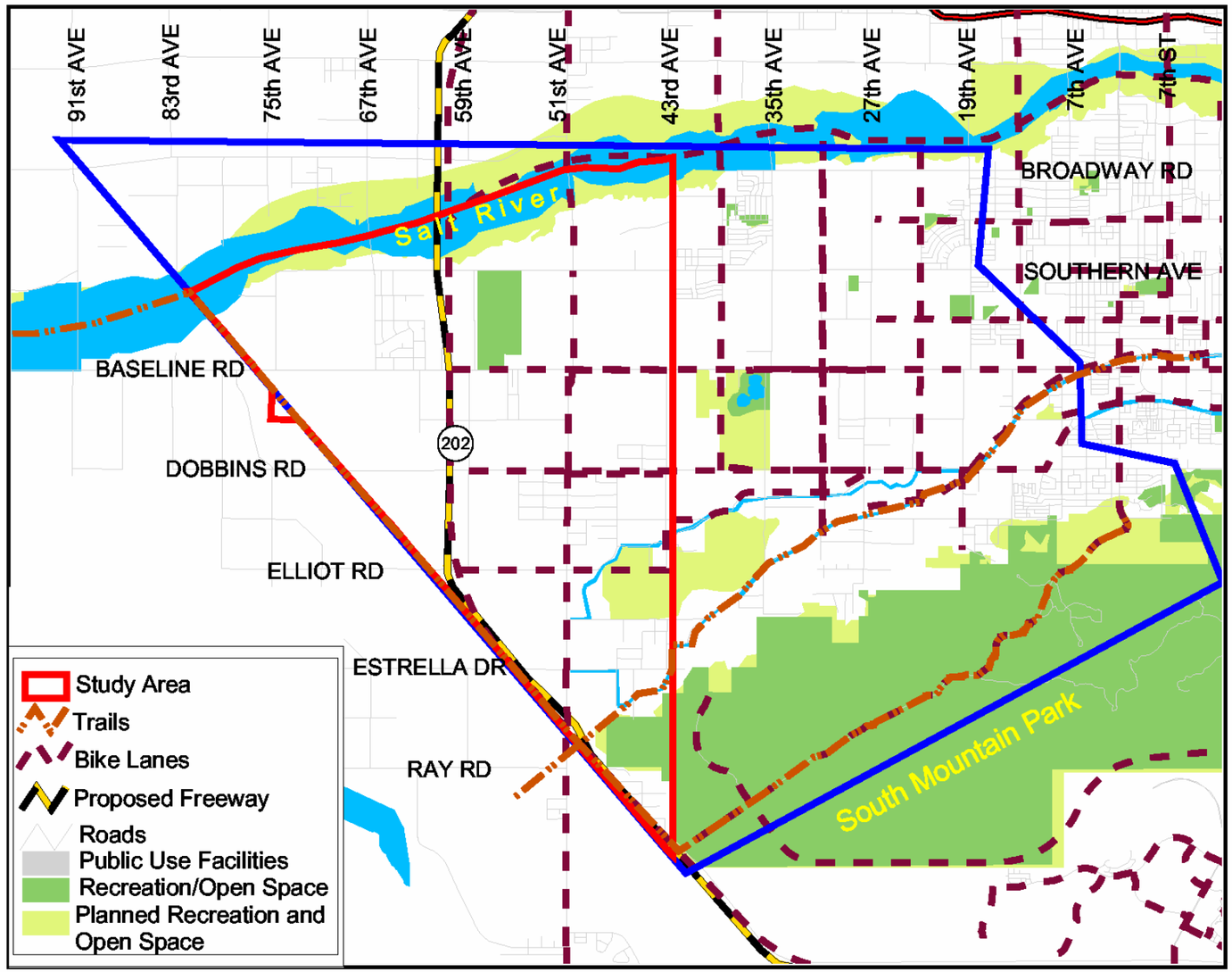



Figure 2-29: Laveen ADMP Modal Map

The Laveen area roadway and vehicular system is similar to other agricultural areas surrounding the Salt River. The major mile and half -mile roads as well as a few isolated subdivision roads are paved. However, in the southwestern portion of the focus area most roads are compacted dirt and gravel.

The main streets providing access to Laveen are 19th Avenue and 51st Avenue, referred to as the gateways to Laveen in the Maricopa County Land Use Plan. 19th Avenue connects Laveen to downtown Phoenix and 51st Avenue connects Pecos Road to I-10. The Laveen area is transitioning to a time where greater vehicular traffic is being observed and this growing trend has been forecasted to continue as the area develops.

Figure 2-30: 59th Avenue and Dobbins Road

MCDOT is currently working on various road projects in the area, mainly on 51st Avenue and Baseline Road. Currently, 51st Avenue is the only street providing access south of South Mountain. It is heavily transited by trucks, which make up 20% of the traffic on 51st Avenue[1]. In addition, this road serves as an alternate route for many drivers who want to avoid the Phoenix Metropolitan area. Also, the Gila River Indian Community casino has generated a significant increase in traffic in the past years. In order to manage these

[1] Maricopa County Department of Transportation 51st/59th Avenue Corridor Truck Bypass Contingency Study.

increasing demands, the MCDOT has greatly improved this roadway along with Baseline Road.

Two roadway projects on 51st Avenue were completed by MCDOT and the City of Phoenix in recent years. The stretch from Baseline Road to Elliot Road was constructed and improved from the existing two lane to a four-lane roadway with raised median. Intersection improvements and other safety modifications to handle the increased traffic are also underway. The second project included the stretch from one-quarter mile south of Baseline Road to the Salt River Bridge. The 51st Avenue Bridge was also replaced due to scour damage from previous flooding events. The new bridge was built alongside the previous bridge and is a four-lane bridge with a raised median. The construction of the new bridge further demonstrates that the 51st Avenue corridor will continue to be the major corridor for traffic within the focus area.


Figure 2-31: 51st Avenue and Dobbins

Baseline Road, between 7th Avenue and 51st Avenue was also widened from a two-lane road to five-lanes, with a left-turn lane in 2000/2001. Traffic signals will be installed at the intersection of Baseline and 51st Avenue. The FCDMC is also participating in this project in the installation of a new storm drain system identified in the previous Laveen Area Drainage Master Study. In fact, most of the improvement projects also included the installation of storm drain facilities in conjunction with the roadwork. Work between MCDOT, FCDMC, and City of Phoenix make possible the success of this joint effort.

Figure 2-32: 51st Avenue and Baseline Road

### *Loop 202 South Mountain Transportation Corridor*

The future Loop 202 South Mountain Transportation Corridor corridor is planned and will be a significant feature in the Laveen ADMP Study area. The latest Arizona Department of Transportation (ADOT) report,

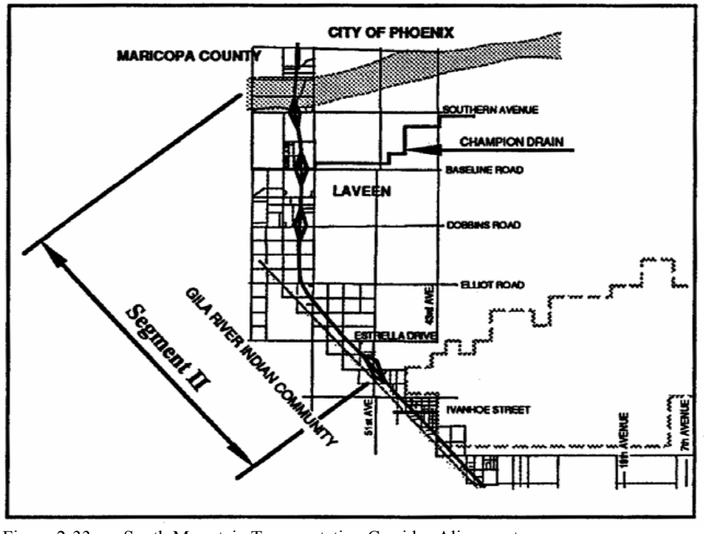



Figure 2-33: South Mountain Transportation Corridor Alignment

prepared by HDR in February 1993, identifies the corridor as being west of 59th Avenue from the Salt River south towards Elliot Road. The transportation corridor heads southeast running parallel to the Gila River Indian Reservation boundary.

Planned drainage improvements incorporated in this project include a reinforced concrete channel that collects stormwater drainage from the transportation corridor. According to the drainage study for the Loop 202, the section from I-10 Papago to the Salt River, including a bridge at the river crossing, is elevated on embankment and will intercept overflows from the east and northeast. The transportation corridor is planned to contain a lined channel along the east of its alignment to serve as an outfall for on-site discharge as well as a conveyance for off-site runoff. Typical cross-sections of the channel are shown in Figure 2-34. The bridge will be analyzed and restudied before design.

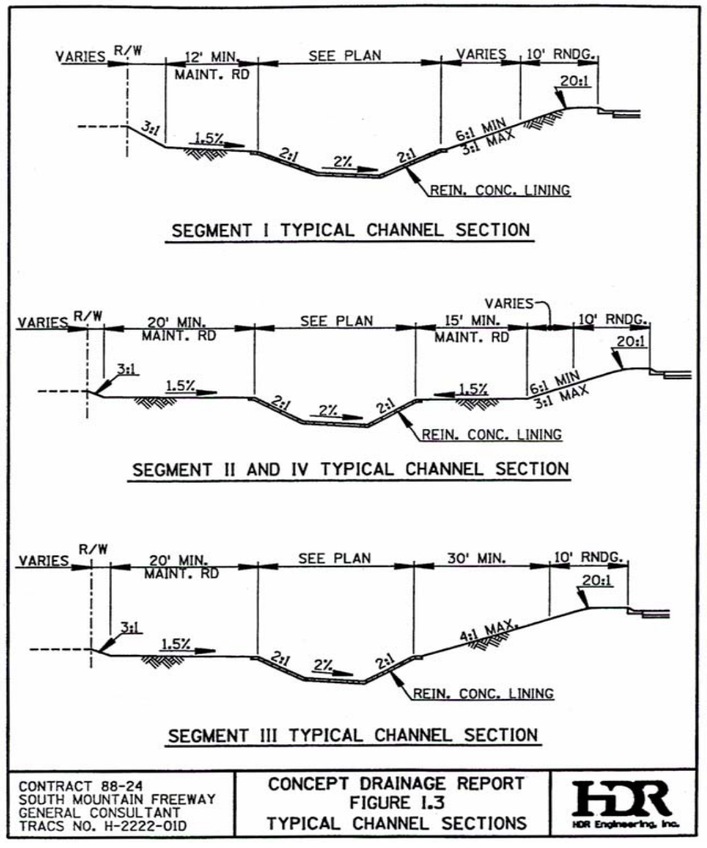



Figure 2-34: Typical lined-channel cross-sections

Another section of the transportation corridor running from the Salt River to 51st Avenue will be similar in nature with the exception of a depressed portion at Dobbins Road. This section of the transportation corridor will also contain a lined channel to collect runoff from overflowing irrigation ditches and storm drain features along the alignment.

The report documents three options where the proposed ADOT drainage study meets the Laveen Area Conveyance Channel alignment. If constructed, flows south of the study area would be collected within the lined channel and conveyed north to the outfall at the Salt River.

***Modal Summary***

A mile-road grid pattern dominates the roadway system, within the study area with 51st Avenue and Baseline Road serving as the two primary roadways. Both roadways have been (or currently are) being improved to urban arterial standards in two to four mile reaches. To date no significant drainage facilities have been included in the design of these roadways. 51st Avenue has a high volume of traffic consisting of through traffic, casino generated traffic, and local transit. Twenty percent of the traffic on this roadway is heavy truck traffic. The Salt River Bridge at 51st Avenue is one of the few crossings of the river and also the only link north to I-10. The proposed South Mountain transportation corridor alignment has been identified at approximately 63rd Avenue from the Salt River south towards Elliot Road and southwest paralleling the Gila River Indian Reservation boundary. The preliminary study for the transportation corridor has a drainage channel that would collect flows from the east and conveys those flows north to the Salt River.

The development of the South Mountain Transportation corridor by ADOT, and improvements to the mile-road system by MCDOT and the city of Phoenix, particularly to 51st Avenue and Baseline Road, are features that will have a significant impact upon local storm drainage and will play a large part in determining the size, type, location and construction timing of drainage facilities planned for in the ADMP.

**GENERAL PLAN LAND USE**

Three plans address land use within the Study area; the Southwest Growth Study, the City of Phoenix General Plan 1985-2000, and the Maricopa County Eye to the Future 2020.

The City of Phoenix adopted the Southwest Growth Study/Laveen in January 1998. The Southwest Growth Study amended the adopted City of Phoenix General Plan and was developed as a result of a 5.6-square mile annexation and heightened interest in constructing the Southwest Loop. The Southwest Growth Study covers all land bounded by 27th Avenue, South Mountain Park, the Gila River Indian Community and the Salt River. It includes unincorporated land in Maricopa County. Maricopa County, through its comprehensive planning program, will follow City plans for unincorporated properties with the City of Phoenix Metropolitan Planning area if the City has involved County residents in the Planning effort. (Page 2, City Council Approval for Southwest Growth Study/Laveen).

Areas outside the Laveen area are included in the City of Phoenix General Plan and have no specific area plans associated with them. Figure 2-35 depicts planned land use for the study area.

The largest land areas are reserved for large-lot residential and open space. A large portion of the area's open space consists of the City of Phoenix owned South Mountain Park. Other areas, south of Baseline Road and east of 27th Avenue and around the traditional Laveen core at 51st Avenue and Dobbins Road are existing low-density residential areas and are planned to remain as such.

Newly developing areas, such as the areas west of 27th avenue north of Dobbins Road, around the Southwest Loop at 61st avenue and around Alvord Park are largely undeveloped and planned for higher density residential and higher intensity commercial uses. The approximate acres and percent of the study area by land use are shown in Table 2.

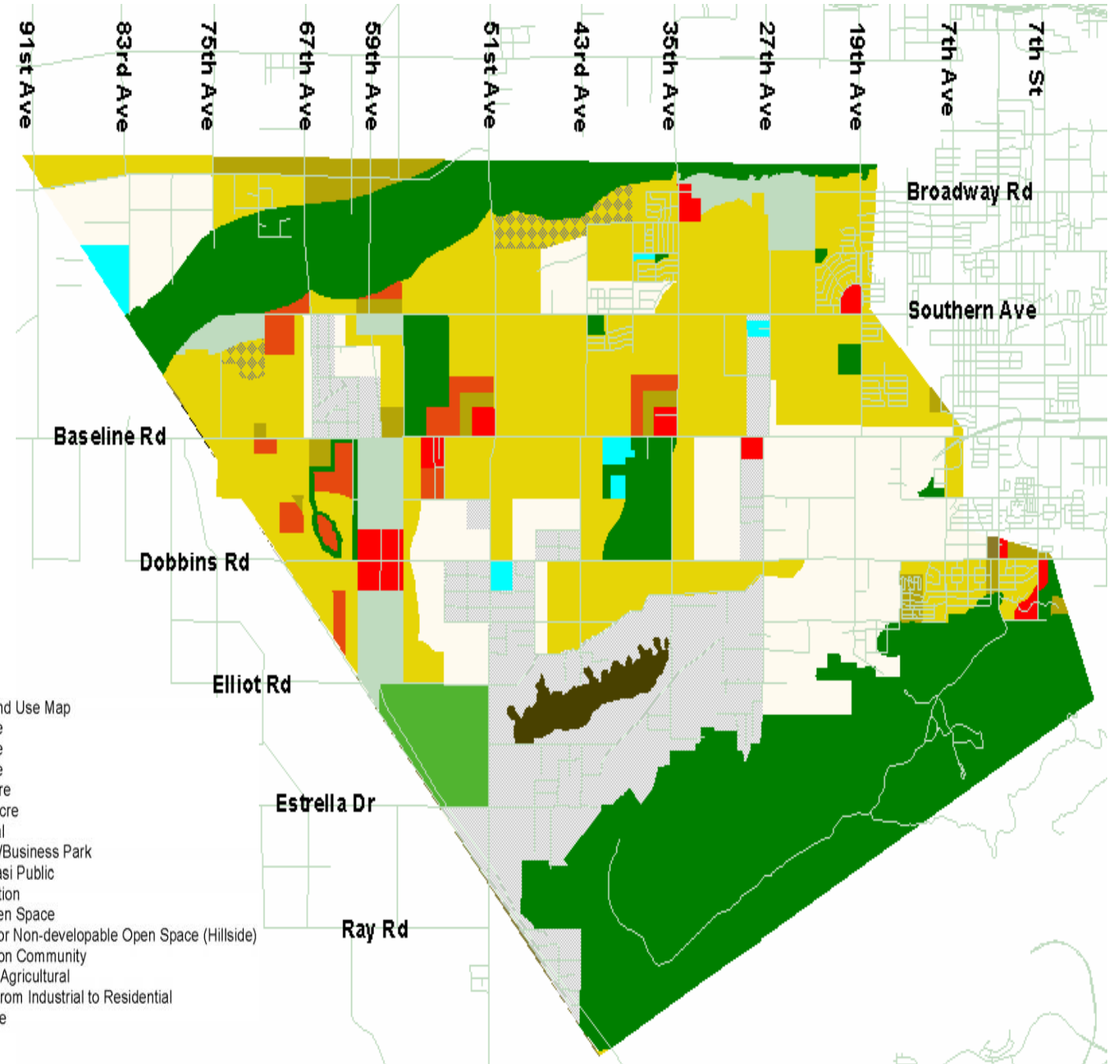



Figure 2-35: Laveen Land Planned Use

Source: Southwest Growth Study/Laveen Land Use Laveen General Plan Land Use (City of Phoenix) combined with the Maricopa Association of Governments General Plan Land Use.

Table 2: Laveen ADMP Study Area by Land Use

| Use Description | Acreage | Area (%) |
|---|---|---|
| Transportation | 2.9 | <0.1% |
| >15 Du/acre | 16.2 | 0.1% |
| Mixed Use Agricultural | 42.4 | 0.1% |
| 10-15 Du/acre | 232.0 | 0.8% |
| Public/ Quasi Public | 236.8 | 0.8% |
| Transition from Industrial to Residential | 302.7 | 1.0% |
| Dedicated or Non-Developable | 342.2 | 1.1% |
| Commercial | 441.3 | 1.4% |
| 5-15 Du/acre | 485.9 | 1.6% |
| 5-10 Du/acre | 539.2 | 1.8% |
| Conservation Community | 589.9 | 1.9% |
| Commerce/Business Park | 997.7 | 3.2% |
| 0-1 Du/acre | 3885.9 | 12.6% |
| 0-2 Du/acre | 4758.3 | 15.5% |
| 2-5 Du/acre | 8775.3 | 28.6% |
| Parks/Open Space | 9077.6 | 29.5% |
| | 30,726 (48 sq. mi.) | 100% |

Source: Southwest Growth Study/Laveen Land Use Laveen General Plan Land Use (City of Phoenix) combined with the Maricopa Association of Governments General Plan Land Use.

The Southwest Growth Study/Laveen recognizes the importance of a rural lifestyle to current residents and seeks to balance current residents concerns with demands of new development. It includes ideas and design concepts for residential and commercial development and concepts for building, parking lot, open space and park and trail designs.

Other Plans applicable to the Study Area include the *Residential Design Guidelines for the Preservation of Rural Character: Laveen*, the *Laveen Watercourse/Green Belt Pedestrian Trail* and the Scenic Drive Designation included in the City of Phoenix General Plan. A General Plan Amendment for the area south of Baseline Road between 63rd and 59th Avenues (approximately) is also under consideration.

The *Residential Design Guidelines for the Preservation of Rural Character: Laveen* includes recommendations for subdivision design, walls, signs, street scapes, fencing, rooflines and housing footprints, porches and verandahs, trail system, and vegetation.

The *Laveen Watercourse/Green Belt Pedestrian Trail* has no formal plan but includes a schematic diagram showing a network of trails generally following a meandering 59th Avenue bordered on the east by a park, and a greenbelt on the south and west sides of a loop road that extends from approximately 51st to 69th Avenues.

The Baseline Road Scenic Drive was approved as an Amendment to the City of Phoenix General Plan in July 1999. The Scenic Drive includes Baseline and Dobbins Roads, 51st Avenue between Baseline and Dobbins Roads and 59th Avenue from Estrella Drive to Southern Avenue. The scenic cross section would include a 14-foot median in 110 feet of right of way, and 24-foot medians and 50-foot landscaped setbacks along Baseline Road.

The proposed General Plan Amendment would result in changes in land uses along the Southwest loop from Commerce Park to C-2 and Commerce Park/General Commerce Park, some higher intensity land uses at approximately 57th Avenue south of Baseline Road and a school site on the north side of West South Mountain Avenue.

***Trails And Open Space***

The Southwest Growth Area/Laveen, Laveen Watercourse/Green Belt Pedestrian Trail, Baseline Road Scenic Drive and proposed General Plan Amendment all include plans for open space and trails. In addition, the City of Phoenix and Maricopa County have designated on street bike lanes identified in their respective General and Comprehensive Plans. These plans are discussed as follows.

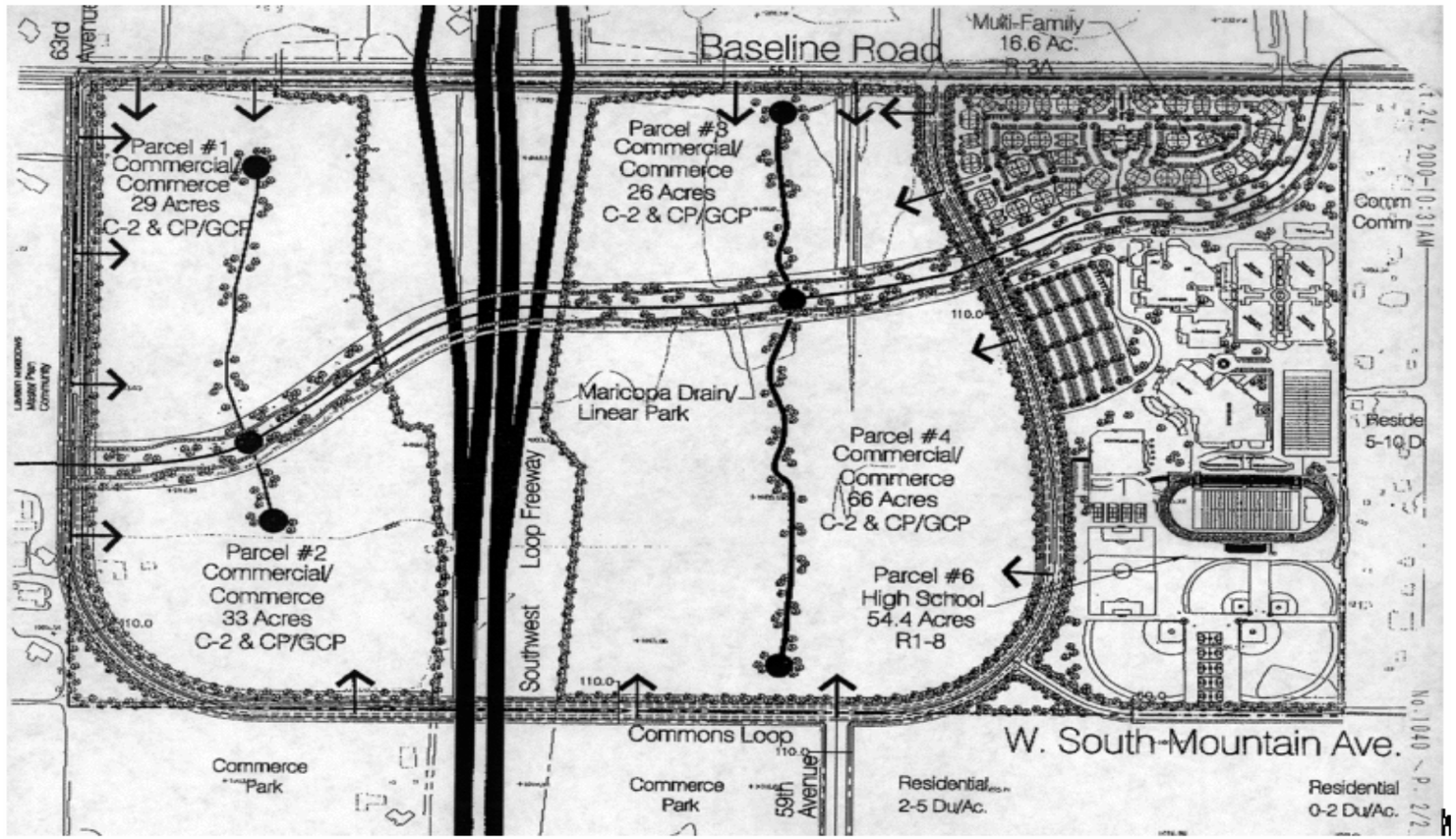



Figure 2-36: Sketch from the proposed General Plan Amendment

*Bikeways*

The City of Phoenix has planned for approximately 54 miles of on-street bike lanes within the study area (source: City of Phoenix, Maricopa County). These lanes are primarily along arterial streets.

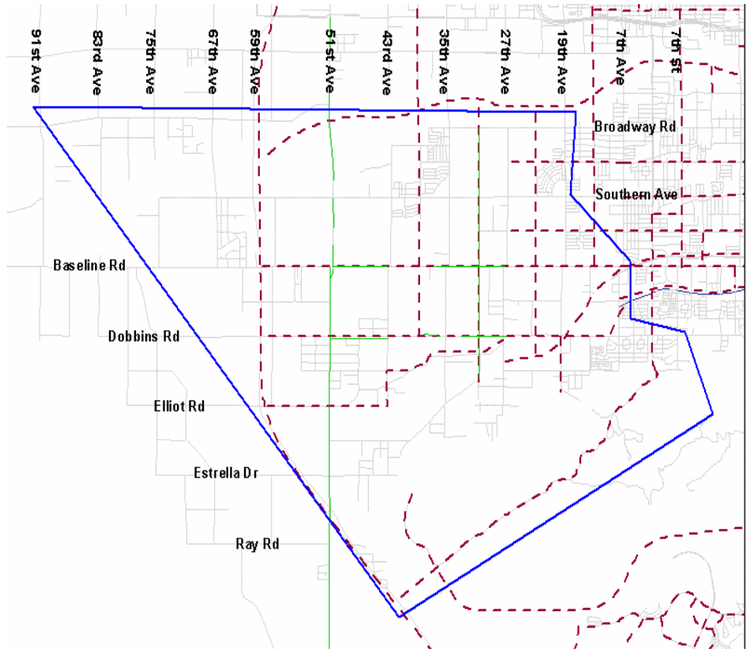



Figure 2-37: Existing and planned bike lanes for the Laveen ADMP study area

Source: City of Phoenix and Maricopa County

In addition, the Maricopa County Department of Transportation has an additional eight miles of trails planned for the area (source: Maricopa County Department of Transportation). It is unclear if these are planned to be on-street bike lanes or multi-use paths alongside major streets.

*Trails*

While there is a lack of formal designated shared used trails within the Study Area, canals and informal paths abound. Residents and the City have recognized that these paths and trails are integral to the rural character and feeling of community shared by residents in the Study area. Consequently, all plans for the study area include trails and greenspaces. Each of these is discussed below.

The Southwest Area Growth Study/Laveen states that multiple use trails are a key component of the land use plan. The trails are planned to provide alternative transportation routes throughout Laveen and make connections to South Mountain Park at 27th Avenue, 35th Avenue, and Estrella Drive. They are also planned to provide Rio Salado Access at 27th Avenue, 43rd Avenue and 71st Avenue. An east-west trail is included as part of the Baseline Road Scenic Drive cross section, and canal banks are also identified as trail locations. Trails are also planned for commercial nodes at 35th and 51st Avenues and Baseline Road northwest through the higher density residential to school sites suggested in the middle of square miles. Trails are intended to provide access to schools, single family subdivisions, transit stops and commercial centers without requiring travel on major streets.

*Laveen Watercourse/Green Belt Pedestrian Trail*

The *Laveen Watercourse/Green Belt Pedestrian Trail* includes a schematic diagram showing a network of trails generally 59th Avenue bordered on the east by a park. It also incorporates a greenbelt on the south and west sides of a loop road extending from approximately 51st to 69th Avenues south of Baseline Road.

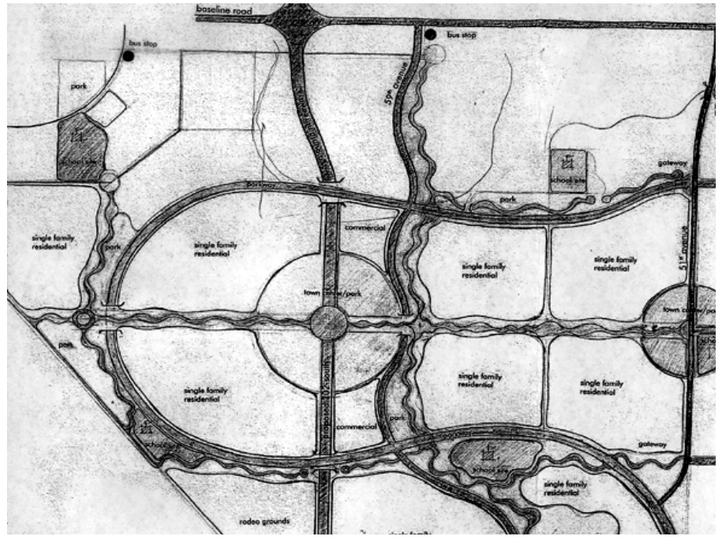



Figure 2-38: Laveen Watercourse/Greenbelt Pedestrian Trail

*Proposed General Plan Amendment*

The Southwest Area Growth Study/Laveen identifies several scenic drives through Laveen. These scenic drives may include easements or rights-of-way dedicated for the express purpose of equestrian, bicycle, or multi-use trails in addition to standard sidewalks.
Baseline and Dobbins Scenic Drives

*Parks/Open Space*

Existing parks within the Laveen area include the South Mountain Park, forming the southern boundary of the study area. South Mountain Park provides miles of hiking and riding trails. Caesar Chavez Park is a community park encompassing 352 acres on the southwest corner of 35th Avenue and Baseline Road. The park includes 25 acres of lakes with numerous recreational amenities. Finally, Playa Margarita Park is a neighborhood park located on Roeser Road between 36th and 37th Avenues.

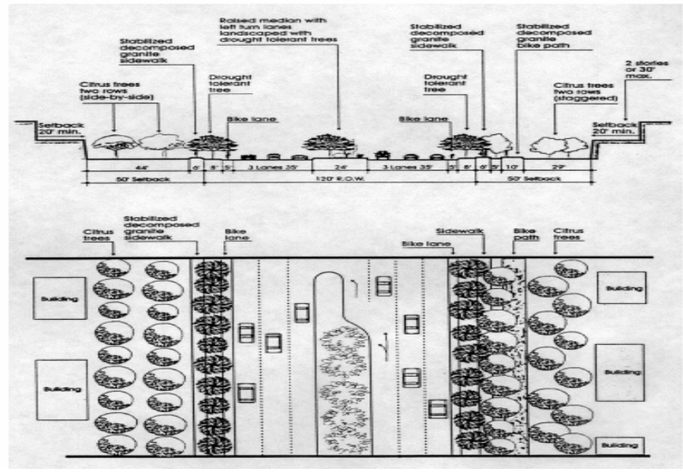



Figure 2-39: Sketch of scenic drive cross-section

The Residential Design Guidelines require that 20% of development be set aside for open space. In addition, the guide calls for developments to preserve, to the extent possible, natural drainage features such as washes and floodplains. The Laveen Elementary School District operates two schools within Laveen: Laveen Elementary (51st Avenue and Dobbins Road) and Cash Elementary School (35th Avenue and Roeser Road).

***General Land Plan Use Summary***

Several planning documents prepared by the City of Phoenix and Maricopa County relate to the Laveen area. While much of Laveen is in un-incorporated areas of Maricopa County, the City of Phoenix's *Southwest Growth Study Area/Laveen* covers all of the land west of 27th Avenue. The plan recognizes the importance of the rural lifestyle to the current residents and seeks to balance those concerns with the demands of new development. This plan indicates the largest land areas are reserved for large-lot residential and open space, thus preserving much of the rural nature of Laveen. Another planning document for Laveen, the Residential Design Guidelines prepared by the City of Phoenix, requires 20% of developments be set aside for open space.

Plans call for making extensive use of the existing canals as trails, providing alternative transportation routes throughout Laveen. Trails are intended to provide access to schools, single-family subdivisions, transit stops and commercial centers, as well as the Salt River and South Mountain Park.

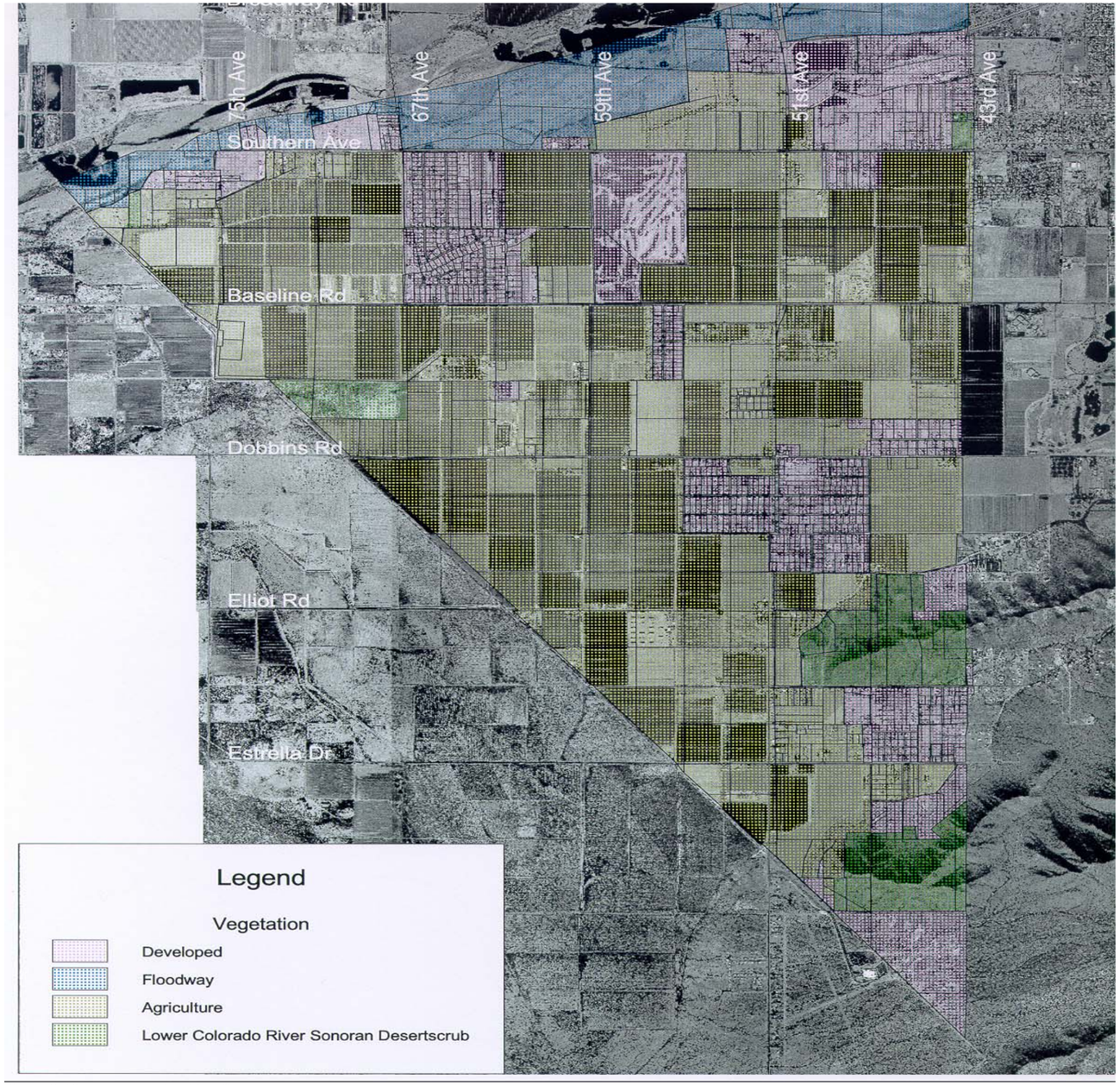



Figure 2-40: Vegetation Map for Laveen ADMP

## ENVIRONMENTAL OVERVIEW

***Physical Environment***

The ADMP study area includes land under the jurisdiction of the City of Phoenix, the community of Laveen, State Land Department and Maricopa County. The focus area is located west of 43rd Avenue, north of the South Mountain Preserve, east of the Gila River Indian Reservation boundary, and south of the Salt River (see Figure 1-1). he legal location of the study area is: Township 1 North, Range 1 East, Sections 35 and 36; Township 1 North, Range 2 East, Sections 31-33; Township 1 South, Range 1 East, Section 1; and Township 1 South, Range 2 East, Sections 4-6, 7-9, 16-18, 20, 21, and 28.

The study area is located in the Basin and Range province of Arizona (Kamilli and Richard 1998) extends north from the western slopes of the South Mountain Preserve to the Salt River. The majority of the area is flat, with changes in contour present only at the base of South Mountain and on the northern boundary adjacent to the Salt River floodplain. The Salt River flows north of the north boundary of the study area and intersects with the Gila River approximately three miles west of the study area. The Gila River runs parallel to and within about 5 miles of the western study area boundary.

***Vegetation***

Vegetation within the study area is classified as ecotonal between creosote-white bursage series of Lower Colorado River Sonoran Desertscrub subdivision and the paloverde-cacti series of Arizona Upland Sonoran Desertscrub subdivision (Brown 1994).

However, due to human disturbance native vegetation within the study area is primarily limited to the Carver Mountain area and the western slopes of South Mountain (see Figure 2-40).

Native vegetation within the study area includes: creosote (*Larrea tridentata*), triangle-leaf bursage (*Ambrosia deltoidea*), ironwood (*Olneya tesota*), mesquite (*Prosopis* sp.), blue paloverde (*Cercidium floridum*), little-leaf paloverde (*Cercidium microphyllum*), saguaro (*Carnegiea gigantea*), barrel cactus (*Ferocactus wislizenii*), teddybear cholla (*Opuntia bigelovii*), buckhorn cholla (*Opuntia* sp.), and desert broom (*Baccharis sarothroides*). Xeroriparian vegetation occurs along washes. Disturbed habitat includes agriculture fields, urban, and suburban housing developments. Vegetation within the disturbed habitat is primarily non-native.

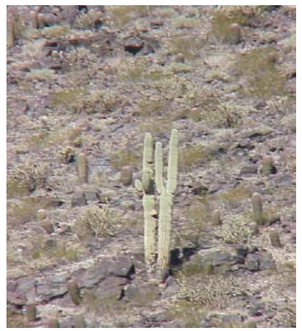


Figure 2-41: Saguaro

Lower Colorado River Valley subdivision vegetation was likely the characteristic cover type of most of the area between the base of South Mountain and the Salt River. This area has been converted to agriculture, industrial, and housing developments. Washes once dissecting the area, are no longer evident. Carver Hills and the western slopes of South Mountain demonstrates the ecotonal vegetation characteristic of the two subdivisions. Following is a brief description of characteristic features of the two subdivisions.

Lower Colorado River Subdivision

This habitat is typically flat, with a one to two percent slope. Species once commonly found along larger drainageways include small trees such as: western honey mesquite (*Prosopis glandulosa*), ironwood, blue paloverde, and smoketree (*Psorothamnus spinosa*) (Brown 1994). Each of these species, except for smoketree, may also be found outside of xeroriparian habitat. This habitat differs structurally from Arizona Upland Sonoran Desertscrub by the poorer representation or absence of little-leaf paloverde and velvet mesquite (*Prosopis velutina*).

Interfluvial flats in this habitat are dominated by creosote bush, and triangle-leaf bursage. Saltbush (*Atriplex* spp.), and jimmyweed (*Happlopappus heterophyllus*) are also common, and catclaw acacia (*Acacia greggii*) is also present. Barrel cactus, ocotillo (*Fouquieria splendens*), and saguaro are widely scattered throughout this habitat, primarily at higher elevations (Brown 1994).

This subdivision has the lowest diversity of wildlife species in the Sonoran desert because of the relatively sparse vegetation and limited plant species diversity. Species that may be present in this habitat are listed in Table 3. The round-tailed ground squirrel (*Spermophilus tereticaudus*) is characteristic of this habitat. Other common mammals include the coyote (*Canis latrans*), kit fox (*Vulpes macrotis*), white-tailed antelope squirrel (*Ammospermophilus leucurus*), desert pocket mouse (Perognathus penicillatus), long-tailed pocket mouse (*Perognathus formosus*), and desert kangaroo rat (*Dipodomys deserti*) (Brown 1994). This is the poorest subdivision for birds, the only diagnostic bird is Leconte's Thrasher (*Toxostoma lecontei*). Other common bird species include Turkey Vulture (*Cathartes aura*) and Mourning Dove (*Zenaida macroura*).

*Arizona Upland Subdivision*

Arizona Upland subdivision paloverde-cacti-mixed scrub series of Sonoran Desertscrub is represented by a relatively larger density of tree species and cacti. Dominant plant species include saguaro and foothill paloverde, with smaller numbers of blue paloverde, ironwood, mesquite, cat-claw acacia, and triangle-leaf bursage. Cholla and barrel cactus are also present.

Figure 2-42: Hillside within Arizona Upland Subdivision

Xeroriparian habitats are also present in the Arizona Upland subdivision. These habitats are long, narrow corridors adjacent to ephemeral washes. Plant species in the xeroriparian habitats are similar to those in Arizona Upland, but occur with higher densities of ironwood, honey mesquite, and blue paloverde.

The Arizona Upland subdivision generally supports a greater variety of wildlife species than the Lower Colorado River subdivision, as listed in Table 3. This is due to greater topographic relief, higher vegetation densities, and greater plant species diversity. Common mammals in this habitat include the black-tailed jackrabbit (*Lepus californicus*), white-throated wood rat (*Neotoma albigula*), Harris' antelope squirrel (*Ammospermophilus harrisii*), and several species of bats. This series is noted for its rich birdlife. Some characteristic bird species include Harris' Hawk (*Parabuteo unicinctus*), White-winged Dove (*Zenaida macroura*), Gambel's quail (*Callipepla gambelii*), Gilded Flicker (*Colaptes chrysoides*), Cactus Wren (*Campylorhynchus brunneicapillus*), and Curve-billed Thrasher (*Toxostoma curvirostre*) (Brown 1994).

*Agricultural Land*

Agricultural land covers the majority of the study area, particularly northwest of Carver Hills. Conversion of desertscrub to agriculture requires the complete removal of native vegetation. Land in this classification includes fallow fields, recently plowed fields, cotton crops, and plant nurseries.

Figure 2-43: Agricultural Land

The quality and potential for wildlife use varies with the type of crop, growth cycle stage, and intensity of irrigation. Irrigated lands increase and change the diversity of animal species that could be present.

Wildlife species present in this habitat must be able to tolerate a high level of human activity. Some typical mammals in the agricultural areas include black-tailed jackrabbit, Botta's pocket gopher (*Thomomys bottae*), cactus mouse (*Peromyscus eremicus*), and coyote. Many bird species are able to forage in agricultural areas, although they might need other areas for cover. Some common birds include Burrowing Owl (*Athene cunicularia*) (see Figure 2-44), Killdeer (*Charadrius vociferus*), Greater Roadrunner (*Geococcyx californianus*), Horned Lark (*Eremophiila alpestris*), Vesper Sparrow (*Pooecetes gramineus*), and Brown-headed Cowbird (*Molothrus ater*). Raptors are common in agricultural areas where they can easily forage on insects and rodents. The most common raptors are red-tailed hawks (*Buteo jamaicensis*) and American Kestrel (*Falco sparverius*), with Northern Harrier (*Circu cyaneus*) present in the winter.

Figure 2-44: Burrowing Owls

The periodicity of agriculture practices limits suitability of habitat for reptiles. However, irrigation canals can provide suitable habitat for many amphibian species. Some species that could occur include the tree lizard, gopher snake (*Pituophis melanoleucus*), and western diamond rattlesnake (*Crotalus atrox*).

*Urban Development*

Figure 2-45: Urban development within the Laveen ADMP study area

The urban development within the study area is interspersed with agriculture areas. Urban development includes low-density residential areas, high-density residential areas, commercial and industrial sites, schools, and recreation areas such as a golf course and informal horse trails. The area of urban development within the area is increasing, with the conversion of agriculture lands to housing communities.

The presence of wildlife in an urban environment is dependent on the extent of removal of native vegetation and the intensity of human activities. High-density residential areas and commercial and industrial properties will support very few species. North of Carver Hills and South Mountain very little native vegetation exists, however low-density residential areas offer a lower intensity of human activity.

Mammals able to adapt to high levels of human activity include the desert cottontail (*Sylvilagus audubonii*), house mouse (*Mus musculus*), and coyote. Several species of bats could forage for insects in urban areas. Bird species common in urban environments include Rock Dove (*Columba livia*), European Starling (*Sturnus vulgaris*), Great-tailed Grackle (*Quiscalus mexicanus*), House Finch (*Carpodacus mexicanus*), and House Sparrow (*Passer domesticus*). Reptiles and amphibians, other than the introduced Mediterranean gecko (*Hemidactylus turcicus*), are generally poorly represented in urban environments.

Table 3: Mammal species that could occur in vegetative communities present in the Laveen ADMP focus area A – Lower Colorado River B – Xeroriparian Washes C – Sonoran Upland Desertscrub D – Agriculture Areas E – Urban Area F – Canals, Ponds, Lakes

| Common Name | Scientific Name | A | B | C | D | E | F |
|---|---|---|---|---|---|---|---|
| Desert shrew | *Notiosorex crawfordi* | Y | Y | Y | | | |
| California-leaf nosed bat | *Macrotus californicus* | Y | Y | Y | Y | | |
| Lesser long-nosed bat | *Leptonycteris curasoae* | Y | Y | Y | | | |
| Yuma myotis | *Myotis yumanensis* | | | | | | Y |
| Cave myotis | *Myotis velifer* | Y | Y | Y | Y | Y | Y |
| California myotis | *Myotis californicus* | Y | Y | Y | Y | Y | Y |
| Western pipistrelle | *Pipistrellus hesperus* | Y | Y | Y | Y | Y | Y |
| Big brown bat | *Eptesicus fuscus* | Y | Y | Y | Y | Y | Y |
| Southern yellow bat | *Lasiurus ega* | Y | Y | Y | Y | Y | Y |
| Townsend's big-eared bat | *Corynorhinus townsendii* | Y | Y | Y | Y | Y | Y |
| Pallid bat | *Antrozous pallidus* | Y | Y | Y | Y | Y | Y |
| Brazilian free-tailed bat | *Tadarida brasiliensis* | Y | Y | Y | Y | Y | Y |
| Pocketed free-tailed bat | *Nyctinomops femorosaccus* | Y | Y | Y | Y | Y | Y |
| Big free-tailed bat | *Nyctinomops macrotis* | Y | Y | Y | Y | Y | Y |
| Western mastiff bat | *Eumops perotis* | Y | Y | Y | Y | Y | Y |
| Desert cottontail * | *Sylvilagus audubonii* | Y | Y | Y | Y | Y | |
| Black-tailed jackrabbit | *Lepus californicus* | Y | Y | Y | Y | Y | |
| Harris' antelope squirrel | *Ammospermophilus harrisii* | Y | Y | Y | Y | Y | |
| Rock squirrel | *Spermophilus variegatus* | Y | Y | Y | Y | | |
| Round-tailed ground squirrel | *Spermophilus tereticaudus* | Y | Y | Y | Y | Y | |
| Botta's pocket gopher | *Thomomys bottae* | Y | Y | Y | Y | Y | |
| Little pocket mouse | *Perognathus longimembris* | Y | | | | | |
| Arizona pocket mouse | *Perognathus amplus* | Y | | Y | | | |
| Desert pocket mouse | *Chaetodipus penicillatus* | Y | Y | Y | Y | | |
| Bailey's pocket mouse | *Chaetodipus baileyi* | Y | Y | Y | Y | | |
| Rock pocket mouse | *Chaetodipus intermedius* | | | Y | | | |
| Merriam's kangaroo rat | *Dipodomys merriami* | Y | | Y | | | |
| Desert kangaroo rat | *Dipodomys deserti* | Y | Y | | | | |
| Western harvest mouse | *Reithrodontomys megalotis* | Y | Y | Y | Y | | |
| Cactus mouse | *Peromyscus eremicus* | Y | Y | Y | Y | | |
| Deer mouse | *Peromyscus maniculatus* | | | | | | |
| Southern grasshopper mouse | *Onychomys torridus* | Y | Y | Y | | | |
| Arizona cotton rat | *Sigmodon arizonae* | Y | Y | Y | Y | | Y |
| White-throated wood rat | *Neotoma albigula* | Y | Y | Y | | | |
| Desert wood rat | *Neotoma lepida* | Y | Y | Y | | | |
| House mouse | *Mus musculus* | | | | | | Y |
| Coyote * | *Canis latrans* | Y | Y | Y | Y | Y | Y |
| Kit fox | *Vulpes macrotis* | Y | Y | | | | |
| Gray fox | *Urocyon cinereoargenteus* | Y | Y | Y | | | |
| Ringtail | *Bassariscus astutus* | Y | Y | Y | | | |
| Raccoon | *Procyon lotor* | | | | | Y | Y |
| Badger | *Taxidea taxus* | Y | Y | Y | Y | | |
| Spotted skunk | *Spilogale gracilis* | Y | Y | Y | | | |
| Striped skunk | *Mephitis mephitis* | | | | Y | | |
| Mountain lion | *Felis concolor* | | | Y | | | |
| Bobcat | *Felis rufus* | Y | Y | Y | Y | | |
| Collared peccary | *Tayassu tajacu* | | Y | Y | | | |
| Mule deer | *Odocoileus hemionus* | Y | Y | Y | | | |
| Bighorn sheep | *Ovis canadensis* | | | Y | | | |
| Otter* | NOT IDENTIFIED | | | | | | Y |
| Pied-billed grebe | *Podilymbus podiceps* | | | | | | Y |
| Eared grebe | *Podiceps nigricollis* | | | | | | Y |
| Great blue heron* | *Ardea herodias* | | | | | | Y |
| Great egret | *A. alba* | | | | Y | | Y |

| Common Name | Scientific Name | A | B | C | D | E | F |
|---|---|---|---|---|---|---|---|
| Snowy egret* | *Egretta thula* | | | | | | Y |
| Cattle egret | *Bubulcus ibis* | | | | Y | | Y |
| Green heron | *Butorides virescens* | | | | | | Y |
| Black-crowned night-heron | *Nycticorax nycticorax* | | | | | | Y |
| Canada goose | *Branta canadensis* | | | | Y | | Y |
| Green-winged teal | *Anas crecca* | | | | | | Y |
| Mallard | *A. platyrhynchos* | | | | Y | Y | Y |
| Northern pintail | *A. acuta* | | | | | | Y |
| Blue-winged teal | *A. discors* | | | | | | Y |
| Cinnamon teal | *A. cyanoptera* | | | | | | Y |
| Northern Shoveler | *A. clypeata* | | | | | | Y |
| Gadwall | *A. strepera* | | | | Y | | Y |
| American wigeon | *A. americana* | | | | Y | | Y |
| Canvasback | *Aythya valisineria* | | | | | | Y |
| Redhead | *A. americana* | | | | | | Y |
| Ring-necked duck | *A. collaris* | | | | | | Y |
| Lesser scaup | *A. affinis* | | | | | | Y |
| Bufflehead | *Bucephala albeola* | | | | | | Y |
| Common merganser | *Mergus merganser* | | | | | | Y |
| Ruddy duck | *Oxyura jamaicensis* | | | | | | Y |
| Turkey vulture* | *Cathartes aura* | Y | Y | Y | Y | Y | |
| Northern harrier | *Circus cyaneus* | Y | | Y | Y | | Y |
| Sharp-shinned hawk | *Accipiter striatus* | Y | Y | Y | Y | Y | |
| Cooper's hawk | *A. cooperii* | Y | Y | Y | Y | Y | |
| Gray hawk | *Asturina nitida* | | | | Y | | |
| Harris' hawk | *Parabuteo unicinctus* | Y | Y | Y | Y | Y | |
| Swainson's hawk | *Buteo swainsoni* | Y | | Y | Y | | |
| Red-tailed hawk* | *B. jamaicensis* | Y | Y | Y | Y | Y | |
| Ferruginous hawk | *B. regalis* | Y | | | Y | | |
| American kestrel | *Falco sparverius* | Y | Y | Y | Y | Y | |
| Prairie falcon | *F. mexicanus* | Y | Y | Y | Y | Y | |
| Peregrine falcon | *F. peregrinus* | Y | Y | Y | Y | Y | Y |
| Gambel's quail* | *Callipepla gambelii* | Y | Y | Y | Y | Y | |
| Virginia rail | *Rallus limicola* | | | | | | Y |
| Sora | *Porzana carolina* | | | | | | Y |
| Common moorhen | *Gallinula chloropus* | | | | | | Y |
| American coot | *Fulica americana* | | | | | | Y |
| Semipalmated plover | *Charadrius semipalmatus* | | | | | | Y |
| Killdeer* | *C. vociferus* | | | | Y | Y | Y |
| Black-necked stilt | *Himantopus mexicanus* | | | | | | Y |
| American avocet | *Recurvirostra americana* | | | | | | Y |
| Greater yellowlegs | *Tringa melanoleuca* | | | | Y | | Y |
| Lesser yellowlegs | *T. flavipes* | | | | Y | | Y |
| Spotted sandpiper | *Actitis macularia* | | | | | | Y |
| Long-billed curlew | *Numenius americanus* | | | | Y | | Y |
| Western sandpiper | *Calidris mauri* | | | | | | Y |
| Least sandpiper | *C. minutilla* | | | | | | Y |
| Baird's sandpiper | *C. bairdii* | | | | | | Y |
| Pectoral sandpiper | *C. melanotus* | | | | | | Y |
| Long-billed dowitcher | *Limnodromus scolopaceus* | | | | | | Y |
| Common snipe | *Gallinago gallinago* | | | | Y | | Y |
| Wilson's phalarope | *Phalaropus tricolor* | | | | | | Y |
| Red-necked phalarope | *P. lobatus* | | | | | | Y |
| Ring-billed gull | *Larus delawarensis* | | | | Y | | Y |

| Common Name | Scientific Name | A | B | C | D | E | F |
|---|---|---|---|---|---|---|---|
| Forster's tern | *Sterna forsteri* | | | | | | Y |
| Rock dove | *Columba livia* | | | | Y | Y | |
| White-winged dove | *Zenaida asiatica* | Y | Y | Y | Y | Y | |
| Mourning dove* | *Zenaida macroura* | Y | Y | Y | Y | Y | |
| Inca dove | *Columbina inca* | Y | Y | Y | Y | Y | |
| Common ground-dove | *C. passerina* | Y | Y | | Y | | |
| Greater roadrunner* | *Geococcyx californianus* | Y | Y | Y | Y | Y | |
| Western screech-owl | *Asio kennicottii* | | Y | Y | | Y | |
| Great horned owl | *Bubo virginianus* | | Y | Y | Y | Y | |
| Elf owl | *Micrathene whitneyi* | Y | Y | Y | | | |
| Burrowing owl* | *Athene cunicularia* | Y | | Y | Y | | |
| Short-eared owl | *Asio flammeus* | | | | Y | | |
| Lesser nighthawk* | *Chordeiles acutipennis* | Y | | Y | Y | | |
| Common poorwill | *Phalaenoptilus nuttallii* | Y | | Y | | | |
| White-throated swift | *Aeronautes saxatalis* | | | | | Y | Y |
| Black-chinned hummingbird | *Archilochus alexandri* | | Y | | | Y | |
| Anna's hummingbird* | *Calypte anna* | | Y | | Y | Y | |
| Costa's hummingbird | *C. costae* | Y | Y | Y | | | |
| Rufous hummingbird | *Selasphorus rufus* | | Y | | | Y | |
| Belted kingfisher | *Ceryle alcyon* | | | | | | Y |
| Gila woodpecker* | *Melanerpes uropygialis* | Y | Y | Y | Y | Y | |
| Red-naped sapsucker | *Sphyrapicus nuchalis* | | Y | | | Y | |
| Ladder-backed woodpecker | *Picoides scalaris* | Y | Y | Y | | | |
| Northern flicker | *Colaptes auratus* | | Y | Y | | Y | |
| Gilded flicker | *C. chrysoides* | Y | Y | Y | | | |
| Western wood-pewee | *Contopus sordidulus* | | Y | | | Y | |
| Hammond's flycatcher | *Empidonax hammondii* | | Y | | | | |
| Kit fox | *Vulpes macrotis* | Y | Y | | | | |
| Gray fox | *Urocyon cinereoargenteus* | Y | Y | Y | | | |
| Ringtail | *Bassariscus astutus* | Y | Y | Y | | | |
| Raccoon | *Procyon lotor* | | | | | Y | Y |
| Badger | *Taxidea taxus* | Y | Y | Y | Y | | |
| Spotted skunk | *Spilogale gracilis* | Y | Y | Y | | | |
| Striped skunk | *Mephitis mephitis* | | | | Y | | |
| Mountain lion | *Felis concolor* | | | Y | | | |
| Bobcat | *Felis rufus* | Y | Y | Y | Y | | |
| Collared peccary | *Tayassu tajacu* | | Y | Y | | | |
| Mule deer | *Odocoileus hemionus* | Y | Y | Y | | | |

Table 3: Mammal species that could occur in vegetative communities present in the Laveen ADMP focus area A – Lower Colorado River B – Xeroriparian Washes C – Sonoran Upland Desertscrub D – Agriculture Areas E – Urban Areas F – Canals, Ponds, Lakes

| Common Name | Scientific Name | A | B | C | D | E | F |
|---|---|---|---|---|---|---|---|
| Bighorn sheep | *Ovis canadensis* | | | Y | | | |
| Otter* | NOT IDENTIFIED | | | | | | Y |
| Pied-billed grebe | *Podilymbus podiceps* | | | | | | Y |
| Eared grebe | *Podiceps nigricollis* | | | | | | Y |
| Great blue heron* | *Ardea herodias* | | | | | | Y |
| Great egret | *A. alba* | | | | Y | | Y |
| Snowy egret* | *Egretta thula* | | | | | | Y |
| Cattle egret | *Bubulcus ibis* | | | | Y | | Y |
| Green heron | *Butorides virescens* | | | | | | Y |
| Black-crowned night-heron | *Nycticorax nycticorax* | | | | | | Y |
| Canada goose | *Branta canadensis* | | | | Y | | Y |
| Green-winged teal | *Anas crecca* | | | | | | Y |
| Mallard | *A. platyrhynchos* | | | | Y | Y | Y |
| Northern pintail | *A. acuta* | | | | | | Y |
| Blue-winged teal | *A. discors* | | | | | | Y |
| Cinnamon teal | *A. cyanoptera* | | | | | | Y |
| Northern Shoveler | *A. clypeata* | | | | | | Y |
| Gadwall | *A. strepera* | | | | Y | | Y |
| American wigeon | *A. americana* | | | | Y | | Y |
| Canvasback | *Aythya valisineria* | | | | | | Y |
| Redhead | *A. americana* | | | | | | Y |
| Ring-necked duck | *A. collaris* | | | | | | Y |
| Lesser scaup | *A. affinis* | | | | | | Y |
| Bufflehead | *Bucephala albeola* | | | | | | Y |
| Common merganser | *Mergus merganser* | | | | | | Y |
| Ruddy duck | *Oxyura jamaicensis* | | | | | | Y |
| Turkey vulture* | *Cathartes aura* | Y | Y | Y | Y | Y | |
| Northern harrier | *Circus cyaneus* | Y | | Y | Y | | Y |
| Sharp-shinned hawk | *Accipiter striatus* | Y | Y | Y | Y | Y | |
| Cooper's hawk | *A. cooperii* | Y | Y | Y | Y | Y | |
| Gray hawk | *Asturina nitida* | | | | Y | | |
| Harris' hawk | *Parabuteo unicinctus* | Y | Y | Y | Y | Y | |
| Swainson's hawk | *Buteo swainsoni* | Y | | Y | Y | | |
| Red-tailed hawk* | *B. jamaicensis* | Y | Y | Y | Y | Y | |
| Ferruginous hawk | *B. regalis* | Y | | | Y | | |
| American kestrel | *Falco sparverius* | Y | Y | Y | Y | Y | |
| Prairie falcon | *F. mexicanus* | Y | Y | Y | Y | Y | |
| Peregrine falcon | *F. peregrinus* | Y | Y | Y | Y | Y | Y |
| Gambel's quail* | *Callipepla gambelii* | Y | Y | Y | Y | Y | |
| Virginia rail | *Rallus limicola* | | | | | | Y |
| Sora | *Porzana carolina* | | | | | | Y |
| Common moorhen | *Gallinula chloropus* | | | | | | Y |
| American coot | *Fulica americana* | | | | | | Y |
| Semipalmated plover | *Charadrius semipalmatus* | | | | | | Y |
| Killdeer* | *C. vociferus* | | | | Y | Y | Y |
| Black-necked stilt | *Himantopus mexicanus* | | | | | | Y |
| American avocet | *Recurvirostra americana* | | | | | | Y |
| Greater yellowlegs | *Tringa melanoleuca* | | | | Y | | Y |
| Lesser yellowlegs | *T. flavipes* | | | | Y | | Y |

| Common Name | Scientific Name | A | B | C | D | E | F |
|---|---|---|---|---|---|---|---|
| Spotted sandpiper | *Actitis macularia* | | | | | | Y |
| Long-billed curlew | *Numenius americanus* | | | | Y | | Y |
| Western sandpiper | *Calidris mauri* | | | | | | Y |
| Least sandpiper | *C. minutilla* | | | | | | Y |
| Baird's sandpiper | *C. bairdii* | | | | | | Y |
| Pectoral sandpiper | *C. melanotus* | | | | | | Y |
| Long-billed dowitcher | *Limnodromus scolopaceus* | | | | | | Y |
| Common snipe | *Gallinago gallinago* | | | | Y | | Y |
| Wilson's phalarope | *Phalaropus tricolor* | | | | | | Y |
| Red-necked phalarope | *P. lobatus* | | | | | | Y |
| Ring-billed gull | *Larus delawarensis* | | | | Y | | Y |
| Forster's tern | *Sterna forsteri* | | | | | | Y |
| Rock dove | *Columba livia* | | | | Y | Y | |
| White-winged dove | *Zenaida asiatica* | Y | Y | Y | Y | Y | |
| Mourning dove* | *Zenaida macroura* | Y | Y | Y | Y | Y | |
| Inca dove | *Columbina inca* | Y | Y | Y | Y | Y | |
| Common ground-dove | *C. passerina* | Y | Y | | Y | | |
| Greater roadrunner* | *Geococcyx californianus* | Y | Y | Y | Y | Y | |
| Western screech-owl | *Asio kennicottii* | | Y | Y | | Y | |
| Great horned owl | *Bubo virginianus* | | Y | Y | Y | Y | |
| Elf owl | *Micrathene whitneyi* | Y | Y | Y | | | |
| Burrowing owl* | *Athene cunicularia* | Y | | Y | Y | | |
| Short-eared owl | *Asio flammeus* | | | | Y | | |
| Lesser nighthawk* | *Chordeiles acutipennis* | Y | | Y | Y | | |
| Common poorwill | *Phalaenoptilus nuttallii* | Y | | Y | | | |
| White-throated swift | *Aeronautes saxatalis* | | | | | Y | Y |
| Black-chinned hummingbird | *Archilochus alexandri* | | Y | | | Y | |
| Anna's hummingbird* | *Calypte anna* | | Y | | Y | Y | |
| Costa's hummingbird | *C. costae* | Y | Y | Y | | | |
| Rufous hummingbird | *Selasphorus rufus* | | Y | | | Y | |
| Belted kingfisher | *Ceryle alcyon* | | | | | | Y |
| Gila woodpecker* | *Melanerpes uropygialis* | Y | Y | Y | Y | Y | |
| Red-naped sapsucker | *Sphyrapicus nuchalis* | | Y | | | Y | |
| Ladder-backed woodpecker | *Picoides scalaris* | Y | Y | Y | | | |
| Northern flicker | *Colaptes auratus* | | Y | Y | | Y | |
| Gilded flicker | *C. chrysoides* | Y | Y | Y | | | |
| Western wood-pewee | *Contopus sordidulus* | | Y | | | Y | |
| Hammond's flycatcher | *Empidonax hammondii* | | Y | | | | |
| Dusky flycatcher | *E. oberholseri* | Y | Y | Y | | | |
| Gray flycatcher | *E. wrightii* | | Y | | Y | | |
| Pacific-slope flycatcher | *E. difficilis* | Y | Y | Y | | | |
| Black phoebe | *Sayornis nigricans* | | Y | | | | Y |
| Say's phoebe | *Sayornis saya* | Y | Y | Y | Y | Y | |
| Vermilion flycatcher | *Pyrocephalus rubinus* | | Y | | Y | | Y |
| Ash-throated flycatcher | *Myiarchus cinerascens* | | Y | Y | | | |
| Brown-crested flycatcher | *M. tyrannulus* | | Y | | | | |
| Western kingbird | *Tyrannus verticalis* | Y | Y | Y | Y | Y | |
| Horned lark | *Eremophila alpestris* | Y | | | Y | | |
| Tree swallow | *Tachycineta bicolor* | | | | | | Y |

| Common Name | Scientific Name | A | B | C | D | E | F |
|---|---|---|---|---|---|---|---|
| Violet-green swallow | *T. thalassina* | | | | | | Y |
| Northern rough-winged swallow | *Stelgidopteryx serripennis* | | | | | | Y |
| Bank swallow | *Riparia riparia* | | | | | | Y |
| Cliff swallow | *Petrochelidon pyrrhonota* | | | | | Y | Y |
| Barn swallow | *Hirundo rustica* | | | | Y | Y | Y |
| Common raven* | *Corvus corax* | Y | Y | Y | Y | | |
| Verdin* | *Auriparus flaviceps* | Y | Y | Y | | Y | |
| Cactus wren* | *Campylorhynchus brunneicapillus* | Y | Y | Y | | Y | |
| Rock wren | *Salpinctes obsoletus* | Y | Y | Y | | | |
| Canyon wren | *Catherpes mexicanus* | | | Y | | | |
| Bewick's wren | *Thryomanes bewickii* | | Y | | | Y | |
| House wren | *Troglodytes aedon* | | Y | | | | |
| Marsh wren | *Cistothorus palustris* | | | | | | Y |
| Ruby-crowned kinglet | *Regulus calendula* | Y | Y | Y | | Y | |
| Black-tailed gnatcatcher | *Polioptila melanura* | Y | Y | Y | | | |
| Western bluebird | *Sialia mexicana* | | Y | | Y | | |
| American robin | *Turdus migratorius* | | | | Y | Y | |
| Northern mockingbird* | *Mimus polyglottos* | Y | Y | Y | Y | Y | |
| Sage thrasher | *Oreoscoptes montanus* | Y | | Y | | | |
| Bendire's thrasher | *Toxostoma bendirei* | Y | Y | Y | Y | | |
| Curve-billed thrasher* | *T. curvirostre* | | Y | Y | | Y | |
| Crissal thrasher | *T. crissale* | | Y | | | | |
| LeConte's thrasher | *T. lecontei* | Y | | | | | |
| American pipit | *Anthus rubescens* | | | | Y | Y | Y |
| Cedar waxwing | *Bombycilla cedrorum* | | | | | Y | |
| Phainopepla* | *Phainopepla nitens* | Y | Y | Y | | | |
| Loggerhead shrike | *Lanius ludovicianus* | Y | Y | Y | Y | | |
| European starling* | *Sturnus vulgaris* | Y | Y | Y | Y | Y | |
| Bell's vireo | *Vireo bellii* | | Y | | | | |
| Plumbeous vireo | *V. plumbeus* | | Y | Y | | | |
| Cassin's vireo | *V. cassinii* | | Y | Y | | | |
| Warbling vireo | *V. gilvus* | Y | Y | Y | | | |
| Warbling vireo | *V. gilvus* | Y | Y | Y | | | |
| Orange-crowned warbler | *Vermivora celata* | | | | | Y | |
| Nashville warbler | *V. ruficapilla* | | | | | Y | |
| Lucy's warber | *V. luciae* | Y | Y | Y | | | |
| Yellow warbler | *Dendroica petechia* | | | | | Y | |
| Yellow-rumped warbler | *Dendroica coronata* | | Y | | | Y | |
| Black-throated gray warbler | *D. nigriscens* | | | | | Y | |
| Townsend's warbler | *D. townsendi* | | | | | Y | |
| MacGillivray's warber | *Oporornis tolmiei* | | | | | Y | |
| Common yellowthroat | *Geothlypis trichas* | | | | | Y | Y |
| Wilson's warbler | *Wilsonia pusilla* | | Y | | | Y | |
| Yellow-breasted chat | *Icteria virens* | | | | | | |
| Summer tanager | *Pirangra rubra* | | | | | | |
| Western tanager | *P. ludoviciana* | | Y | | | | |
| Northern cardinal | *Cardinalis cardinalis* | | Y | Y | | | |
| Pyrrhuloxia | *C. sinuatus* | | Y | | | | |

Table 3: Mammal species that could occur in vegetative communities present in the Laveen ADMP focus area

A – Lower Colorado River B – Xeroriparian Washes C – Sonoran Upland Desertscrub D – Agriculture Areas E – Urban Areas F – Canals, Ponds, Lakes

| Common Name | Scientific Name | A | B | C | D | E | F |
|---|---|---|---|---|---|---|---|
| Black-headed grosbeak | *Pheucticus melanocephalus* | | Y | | | | |
| Blue grosbeak | *Guiraca caerulea* | | Y | | Y | | |
| Lazuli bunting | *Passerina amoena* | | Y | | Y | Y | |
| Green-tailed towhee | *Pipilo chlorurus* | | Y | | | Y | |
| Canyon towhee | *P. fuscus* | | Y | Y | | | |
| Abert's towhee | *P. aberti* | | Y | | Y | Y | |
| Chipping sparrow | *Spizella passerina* | | Y | Y | Y | Y | |
| Brewer's sparrow | *S. breweri* | | | Y | Y | Y | |
| Vesper sparrow | *Pooecetes gramineus* | Y | | | Y | | |
| Lark sparrow | *Chondestes grammacus* | | Y | Y | Y | | |
| Black-throated sparrow | *Amphospiza bilineata* | | Y | Y | | | |
| Sage sparrow | *A. belli* | Y | | | | | |
| Lark bunting | *Calamospiza melanocorys* | | | Y | Y | | |
| Savannah sparrow | *Passerculus sandwichensis* | Y | | Y | Y | | |
| Song sparrow* | *Melospiza meloda* | | | | Y | | Y |
| Lincoln's sparrow | | | | | Y | | Y |
| White-crowned sparrow | *Zonotrichia leucophrys* | Y | Y | Y | Y | Y | |
| Dark-eyed junco | *Junco hyemalis* | Y | Y | Y | Y | Y | |
| Red-winged blackbird | *Agelaius phoeniceus* | | | | Y | Y | Y |
| Western meadowlark | *Sturnella neglecta* | Y | | Y | Y | | |
| Yellow-headed blackbird | *Xanthocephalus xanthocephalus* | | | | Y | | Y |
| Brewer's blackbird | *Euphagus cyanocephalus* | | | | Y | | Y |
| Great-tailed grackle* | *Quiscalus mexicanus* | | | | Y | Y | Y |
| Brown-headed cowbird* | *Molothrus ater* | Y | Y | Y | Y | | |
| Hooded oriole | *Icterus cucullatus* | | Y | | Y | | |
| House finch* | *Carpodacus mexicanus* | Y | Y | Y | Y | Y | |
| Lesser goldfinch | *Carduelis psaltria* | | Y | Y | | Y | |
| House sparrow* | *Passer domesticus* | | | | Y | Y | |
| Couch spadefoot | *Scaphiopus couchi* | Y | Y | | | | Y |
| Western spadefoot | *S. hammondi* | Y | Y | | | | Y |
| Woodhouse toad | *Bufo woodhousei* | | Y | | Y | Y | Y |
| Red-spotted toad | *B. punctatus* | | | Y | | | Y |
| Great Plains toad | *B. cognatus* | Y | Y | | | | Y |
| Sonoran Desert toad | *B. alvarius* | | | | Y | Y | Y |
| Lowland leopard frog | *Rana yavapaiensis* | | | | Y | | Y |
| Bullfrog | *R. catesbiana* | | | | Y | | Y |
| Desert tortoise | *Gopherus agassizi* | Y | Y | Y | | | |
| Banded gecko | *Coleonyx variegatus* | Y | Y | Y | | | |
| Desert iguana | *Dipsosaurus dorsalis* | Y | | Y | | | |
| Chuckwalla | *Sauromalus obesus* | Y | | Y | | | |
| Zebratail lizard | *Callisaurus draconoides* | Y | | Y | | | |
| Fringe-toed lizard | *Uma notata* | Y | | | | | |
| Collared lizard | *Crotophytus collaris* | Y | Y | Y | | | |
| Long-nosed leopard lizard | *C. wislizenii* | Y | | Y | | | |
| Desert spiny lizard | *Sceloperus magister* | Y | Y | Y | | | |
| Clark's spiny lizard | *S. clarki* | | | | | | |
| Brush lizard | *Urosaurus graciosus* | Y | | | | | |
| Tree Lizard | *U. ornatus* | | Y | Y | | | |
| Side-blotched lizard | *Uta stansburiana* | Y | Y | Y | Y | Y | |
| Desert horned lizard | *Phrynosoma platyrhinos* | Y | Y | Y | | | |
| Regal horned lizard | *P. solare* | Y | | Y | | | |
| Western whiptail | *Cnemidophorus tigris* | Y | Y | Y | | | |
| Gila monster | *Heloderma suspectum* | Y | Y | Y | | | |
| Rosy boa | *Lichanura trivirgata* | Y | Y | Y | | | |
| Western blind snake | *Leptotyphlops humilis* | Y | Y | Y | | | |
| Spotted leaf-nosed snake | *Phyllorhynchus decurtatus* | Y | Y | | | | |
| Saddled leaf-nosed snake | *P. browni* | | Y | Y | | | |
| Coachwhip | *Masticophis flagellum* | | Y | Y | | | |
| Sonoran whipsnake | *M. bilineatus* | Y | Y | Y | | | |
| Western patch-nosed snake | *Salvadora hexalepsis* | Y | Y | Y | | | |
| Glossy snake | *Arizona elegans* | Y | Y | Y | | | |
| Gopher snake | *Pituophis melanoleucus* | | Y | Y | Y | | |
| Common kingsnake | *Lampropeltis getulus* | | Y | Y | | | |
| Long-nosed snake | *Rhinocheilus lecontei* | Y | Y | Y | | | |
| Checkered garter snake | *Thamnophis marcianus* | | | | Y | Y | Y |
| Western ground snake | *Sonora semiannulata* | Y | Y | Y | Y | | |
| Western shovel-nosed snake | *Chionactus occipitalis* | Y | Y | Y | | | |
| Banded sand snake | *Chilomeniscus cinctus* | Y | Y | Y | | | |
| Night snake | *Hypsiglena toquata* | | | | | | |
| Arizona coral snake | *Micruroides euryxanthus* | | Y | Y | | | |
| Western diamondback rattlesnake | *Crotalus atrox* | Y | Y | Y | Y | | |
| Sidewinder | *C. cerastes* | Y | Y | | | | |
| Tiger rattlesnake | *C. tigris* | Y | Y | Y | | | |
| Mohave rattlesnake | *C. scutulatus* | Y | Y | Y | Y | | |

Sources : Hoffmeister 1986, Jones et al. 1992

### *Aquatic Habitat*

Aquatic habitat within the study area is limited to man-made features such as irrigation canals and lakes at the golf course located between 51st and 59th Avenues. Although these features occupy an extremely small portion of the total area of the site, they can provide habitat for a variety of species. These features provide an open water habitat that can be used by species that are incapable of utilizing other habitat in the study area.

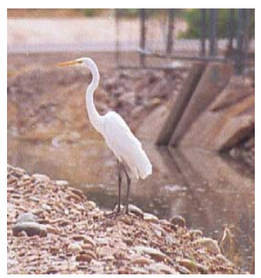


Figure 2-46: Greater Egret

The alluvial plain between South Mountain and the Salt River is crisscrossed with ditches and canals used for agriculture irrigation. The four major irrigation features within the study area are: the Laveen Area Conveyance Channel, Dead Horse Ditch, Western Canal, and the Laveen Drain (see Figure 2-23). The Laveen Drain is a piped drain or pump ditch, but does provide conveyance for other irrigation features in the area.

Many bird species are dependent on open water for foraging or nesting habitat, and they would not be present in this vicinity without open water. These groups of birds include grebes, herons, ducks, rails, plovers, and sandpipers. The water features at the golf course likely provide the best open water habitat in the study area.

Although most mammals require some drinking water, large bodies of open water are usually not an essential part of their habitat requirements. During a field visit, otters were seen in the Maricopa and Dead Horse Drains.

### *Threatened and Endangered Species and Species of Concern*

The USFWS list of federally protected species that have the potential to occur in Maricopa County was accessed. The AGFD was contacted in writing on September 27, 2000 to obtain species information from the Heritage Data Management System. The database tracks records for federally listed species and other species of concern throughout the State of Arizona. The records are indicative of those for which current or historic records exist within a 5-mile radius of a study area.

A field investigation was conducted October 18-20, 2000 to determine the habitat types present in the study area and its immediate vicinity. Dominant vegetation types and species were recorded during the evaluation. Based on documented habitat requirements, a determination was made of the suitability of the study area to support threatened and endangered species as having the potential to occur in Maricopa County. No species–specific surveys were conducted as part of this evaluation.

Appendix D provides a detailed description of the Threatened and Endangered and Species of Concern that may occur within the study area. No suitable areas that sustain threatened or endangered species were found. However, species-specific surveys may be required if the future proposed flood control structures will require removal of native Desertscrub habitat.

In addition, Sonoran desert tortoises may occur within the study area where native vegetation is present. If a desert tortoise is found in the study area during development, it is recommended that the AGFD's Guidelines for Handling Sonoran Desert Tortoises Encountered on Development Projects is followed. The guidelines are attached as part of Appendix E to this report.

Burrowing Owls occur within the study area and were observed along irrigation canals throughout the project area. Species-specific surveys and coordination with the FCDMC will be required prior to any construction activities to mitigate harm and/or harassment of Burrowing Owls within the project area.

***Hazardous Materials Database Search***

A Preliminary Initial Site Assessment (PISA) was performed to determine the potential for hazardous materials to be found in the study area. A hazardous materials records review was conducted within a 1-mile radius of the study area. A total of 236 federal and state environmental records, including hazardous materials incidents, were documented.

Records within the focus area were examined for relevance. For example, isolated minor incidents such as traffic accidents, and drug seizures were not considered further. A total of 15 federal and state environmental records, were documented within the focus area (see Figure 2-47). These records included: two Resource Conservation And Recovery Act (RCRA) compliance facilities, five registered Leaking Underground Storage Tanks (LUST), five registered Underground Storage Tanks (UST), and two dry wells.

Crop dusters were most popular during the late 1950s and early 1960s, and would have been used in this agricultural area. However, no landing fields for crop dusters were documented within the project area, as they did not need to be registered. Local knowledge of the area indicates specified landing field areas are unlikely, as fallow fields and roads would have been used (Wayne Comfort, All Lands, pers. comm. to HDR, 2000) .

The location of known RCRA, LUST, UST, and dry well locations will be considered during the alternative formulation analysis portion of this study. However, due to the limited number of environmental records within the focus area, it is unlikely they will impact the proposed project.

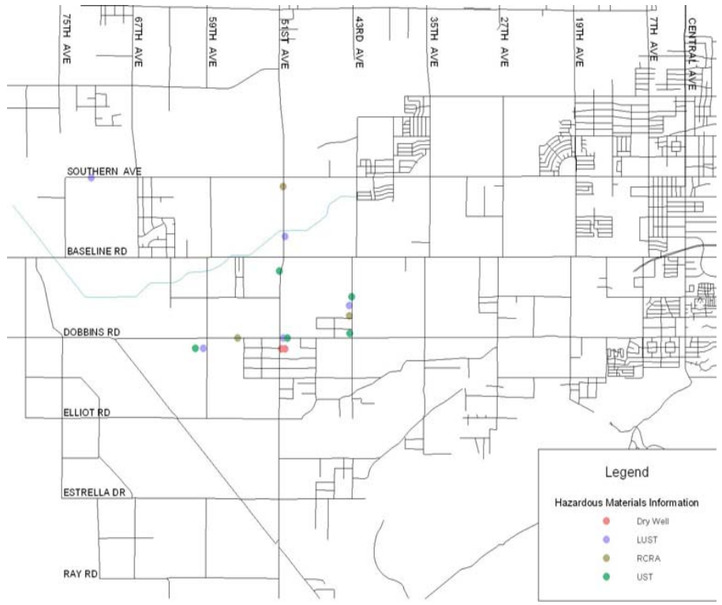



Figure 2-47: Federal And State Environmental Records Within Laveen ADMP Study Area

***Environmental Overview Summary***

Suitable habitat for the Cactus Ferruginous Pygmy-owl occurs within the study area, where native Sonoran Desertscrub occurs. Species-specific surveys for the Cactus Ferruginous Pygmy-owl may be required if project development activities require the removal of suitable Desertscrub habitat. No suitable habitat for other threatened and endangered species for Maricopa County exists within the study area. Suitable habitat exists for the Sonoran desert tortoise and the Burrowing Owl. If a desert tortoise is found within the study area during project development, it is recommended that the AGFD's Guidelines for Handling Sonoran Desert Tortoises Encountered on Development Projects is followed. Species-specific surveys for the Burrowing Owl and coordination with the FCDMC will be required prior to any construction activities to mitigate harm and/or harassment of Burrowing Owls.

Due to the limited number of RCRA, LUST, UST, and dry wells within the study area, it is unlikely they will impact the proposed project.

**CULTURAL RESOURCES**

A diverse range of cultural resources, from prehistoric villages and canals to historic buildings and roads, are located within the Laveen Area Drainage Master Plan project area. Considerations as to how to mitigate potential impacts to these resources will play a major role in the planning process, especially in terms of scheduling, costs, and design parameters.

As a first step towards understanding the diversity and distribution of cultural resources in the project area, FCDMC contracted Scientific Archaeological Services (SAS) to conduct a Class I literature review of all previous work (Rodgers 2000). Archival records were checked at a variety of locations including the Arizona State Museum (ASM), State Historic Preservation Office (SHPO), Arizona State University Department of Anthropology, and Pueblo Grande Museum. The purpose of the literature search was two-fold: (1) to determine how much of the project area had been previously subjected to intensive cultural resources surveys, and (2) to identify the distribution and variability of all previously documented archaeological sites.

The SAS literature search found that 29 cultural resource-related studies have taken place within the project area (see Figure 2-48).

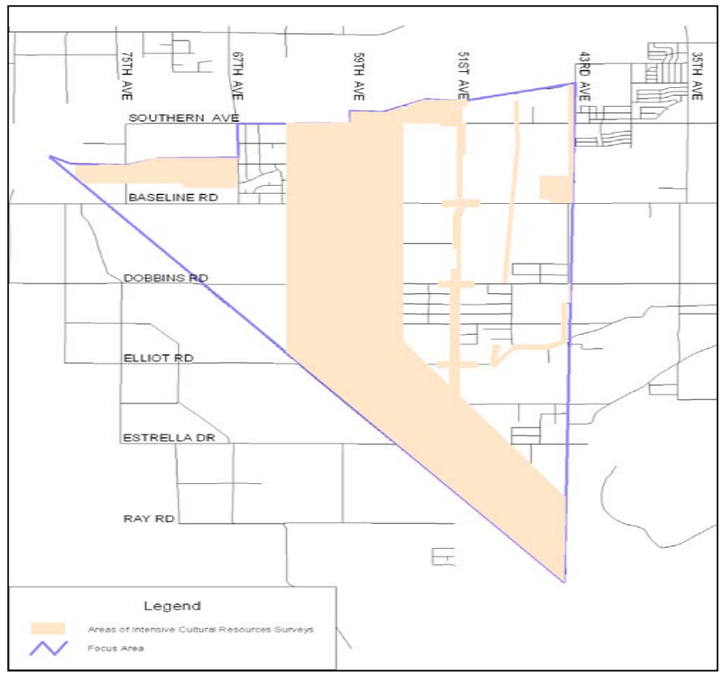



Figure 2-48: Areas previously surveyed within the Laveen ADMP area

Eleven of the studies were fairly recent intensive cultural resource surveys that covered a combined total of 2,710 acres, or approximately 23% of the project area. Forty-nine archaeological sites have been previously documented in the project area (14 prehistoric sites and 35 historic sites). The prehistoric sites include five large villages, five canals segments, three artifact scatters, and one small habitation site. Historic sites include seventeen designated and undesignated roads, six irrigation canals, five residential houses, two mining camps, two general stores, one schoolhouse, one post office, and one well.

It should be noted that although surface manifestations of many of these resources have been obliterated by the transformation of the landscape to agricultural fields, residential areas, and other uses, it is likely that intact cultural deposits and features are preserved subsurface. This is especially true for agricultural fields and roads where subsurface disturbances have been limited to only a few feet.

SAS has recommended that all State and Federal guidelines for managing the treatment and mitigation of cultural resources be included in the final plans for any flood control construction activities (Rodgers 2000). This will primarily entail following the provisions of the National Historic Preservation Act (NHPA), as amended. If the project ends up requiring Federal involvement, and therefore is considered a Federal undertaking, then stipulations of NHPA must be followed.

***Cultural Resources Summary***

Forty-nine archaeological sites have been previously documented in the project area (14 prehistoric sites and 35 historic sites). The prehistoric sites include five large villages, five canals segments, three artifact scatters, and one small habitation site. Historic sites include seventeen designated and undesignated roads, six irrigation canals, five residential houses, two mining camps, two general stores, one schoolhouse, one post office, and one well.

It is recommended that Class III pedestrian surveys be conducted for all areas of planned development, not previously assessed. Sites determined to be eligible or potentially eligible for the National Register of historic Places (NRHP), or NRHP-listed properties, should be avoided. If avoidance is not possible, then any potential impacts will likely have to be mitigated through archaeological testing and/or data recovery excavations.

## GEOTECHNICAL CONSIDERATIONS

Information regarding topography, geology, groundwater, and surface and near-surface soil and rock conditions is presented in this section. The information presented herein is based on research activities only. Figure 2-49 illustrates extent of soil types within the study area as well as groundwater information.

### *Site Characterization*

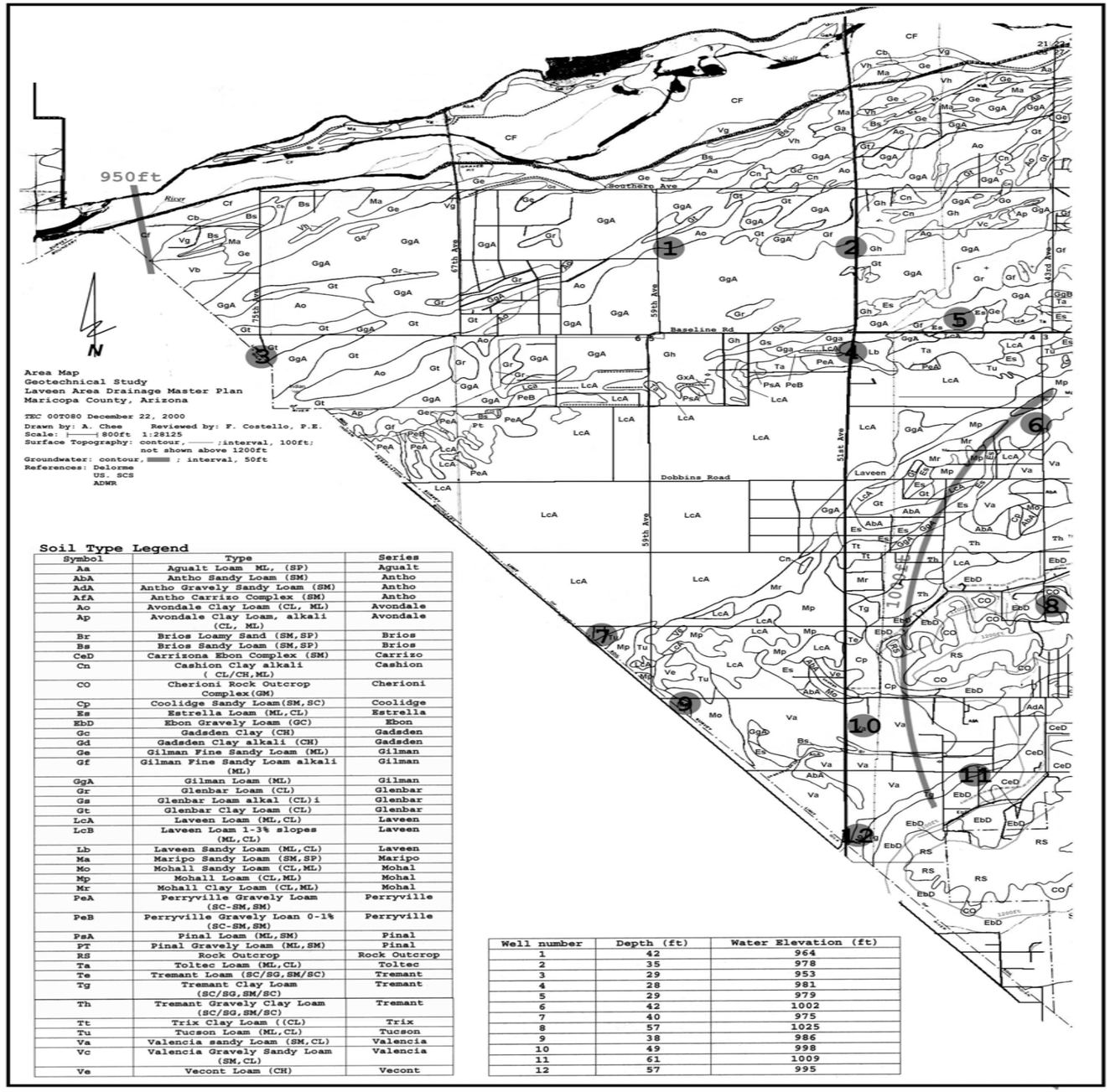
The study area is in a primarily agricultural area southwest of the Phoenix metropolitan area. Other land uses include residential, commercial, industrial, and native desert. At a distance from South Mountain Park, which is where most improvement alternatives are likely to be required, the area is relatively flat. There is a mild downward gradient to the northwest in the valley floor on the order of about 16 feet per mile. Bedrock, related to the South Mountains, is suspected to dip moderately to the north (away from the mountains) and underlie surficial soils comprised of Tertiary (old) and Quaternary (recent) alluvial materials.

Geotechnical factors that may affect the selection process include groundwater and soil conditions. Preliminary index and engineering properties for each mapped soil series that may be used for preliminary evaluation of alternatives are presented in Table 4. Additional geotechnical analysis is recommended when alternatives are preliminarily defined and being evaluated.

### *Groundwater*

Well data in the study area from the 1990s indicates that groundwater will only affect relatively deep improvements because, in most of the study area, groundwater was 30 to 90 feet below the surface.

However, shallower depths were recorded in the northern portion of the site nearer the Salt River Channel. Accordingly, groundwater should be considered a factor in areas of reported shallow groundwater and where relatively deep improvement alternatives are being considered.




**Soil Type Legend**

| Symbol | Type | Series |
|---|---|---|
| Aa | Agualt Loam ML, (SP) | Agualt |
| AbA | Antho Sandy Loam (SM) | Antho |
| AdA | Antho Gravelly Sandy Loam (SM) | Antho |
| AfA | Antho Carrizo Complex (SM) | Antho |
| Ao | Avondale Clay Loam (CL, ML) | Avondale |
| Ap | Avondale Clay Loam, alkali (CL, ML) | Avondale |
| Br | Brios Loamy Sand (SM,SP) | Brios |
| Bs | Brios Sandy Loam (SM,SP) | Brios |
| CeD | Carrizona Ebon Complex (SM) | Carrizo |
| Cn | Cashion Clay alkali ( CL/CH,ML) | Cashion |
| CO | Cherioni Rock Outcrop Complex(GM) | Cherioni |
| Cp | Coolidge Sandy Loam(SM,SC) | Coolidge |
| Es | Estrella Loam (ML,CL) | Estrella |
| EbD | Ebon Gravely Loam (GC) | Ebon |
| Gc | Gadsden Clay (CH) | Gadsden |
| Gd | Gadsden Clay alkali (CH) | Gadsden |
| Ge | Gilman Fine Sandy Loam (ML) | Gilman |
| Gf | Gilman Fine Sandy Loam alkali (ML) | Gilman |
| GgA | Gilman Loam (ML) | Gilman |
| Gr | Glenbar Loam (CL) | Glenbar |
| Gs | Glenbar Loam alkal (CL)i | Glenbar |
| Gt | Glenbar Clay Loam (CL) | Glenbar |
| LcA | Laveen Loam (ML,CL) | Laveen |
| LcB | Laveen Loam 1-3% slopes (ML,CL) | Laveen |
| Lb | Laveen Sandy Loam (ML,CL) | Laveen |
| Ma | Maripo Sandy Loam (SM,SP) | Maripo |
| Mo | Mohall Sandy Loam (CL,ML) | Mohal |
| Mp | Mohall Loam (CL,ML) | Mohal |
| Mr | Mohall Clay Loam (CL,ML) | Mohal |
| PeA | Perryville Gravely Loam (SC-SM,SM) | Perryville |
| PeB | Perryville Gravelly Loan 0-1% (SC-SM,SM) | Perryville |
| PsA | Pinal Loam (ML,SM) | Pinal |
| PT | Pinal Gravely Loam (ML,SM) | Pinal |
| RS | Rock Outcrop | Rock Outcrop |
| Ta | Toltec Loam (ML,CL) | Toltec |
| Te | Tremant Loam (SC/SG,SM/SC) | Tremant |
| Tg | Tremant Clay Loam (SC/SG,SM/SC) | Tremant |
| Th | Tremant Gravely Clay Loam (SC/SG,SM/SC) | Tremant |
| Tt | Trix Clay Loam ((CL) | Trix |
| Tu | Tucson Loam (ML,CL) | Tucson |
| Va | Valencia sandy Loam (SM,CL) | Valencia |
| Vc | Valencia Gravelly Sandy Loam (SM,CL) | Valencia |
| Ve | Vecont Loam (CH) | Vecont |

| Well number | Depth (ft) | Water Elevation (ft) |
|---|---|---|
| 1 | 42 | 964 |
| 2 | 35 | 978 |
| 3 | 29 | 953 |
| 4 | 28 | 981 |
| 5 | 29 | 979 |
| 6 | 42 | 1002 |
| 7 | 40 | 975 |
| 8 | 57 | 1025 |
| 9 | 38 | 986 |
| 10 | 49 | 998 |
| 11 | 61 | 1009 |
| 12 | 57 | 995 |

Figure 2-49: Soil types within Laveen ADMP focus area

Table 4: Summary of Key Soil Condition Elements

| SCS Soil Series | USCS Soil Class | Permeability[1] | | Risk of Corrisivity to- | | Compacted Shear Strength[4] | Erodibility | |
|---|---|---|---|---|---|---|---|---|
| | | Natural Condition | Compacted Condition | Steel[2] | Concrete[3] | | Natural Condition[5] | Compacted[6] Condition |
| Agualt | ML<br>SP | moderate<br>very rapid | high | high | low | medium | slight | |
| Antho | SM | moderate rapid | medium | high | low | medium | slight to moderate | piping |
| Avondale | CL<br>ML | moderate slow<br>moderate | medium | high | low to high | medium | slight | piping |
| Brios | SM<br>SP | rapid | medium | moderate | low to moderate | medium | slight | piping |
| Carrizo | SM<br>SW-SM | rapid | high | low | low | high | slight | |
| Cashion | CL/CH<br>ML | slow | low | high | low to moderate | medium | slight | piping |
| Cherioni-Rock | GM | moderate<br>very slow | | high | low | | slight to moderate | |
| Coolidge | SM<br>SC | moderate rapid | medium | high | low | medium | slight to moderate | piping |
| Ebon | GC | slow | low | high | low | medium | slight to moderate | |
| Estrella | ML<br>CL | moderate slow | medium | high | low | low | slight | piping |
| Gadsden | CH | slow | low | high | moderate | low | slight | |
| Gilman | ML | moderate | medium | high | low to high | low | slight to moderate | piping |
| Glenbar | CL | moderate slow | medium | high | low to moderate | low | slight | piping |
| Laveen | ML<br>CL | moderate | medium | high | low to moderate | low | slight to moderate | piping |
| Maripo | SM<br>SP | moderate | medium | high | low | low | slight | piping |
| Mohall | CL<br>ML | moderate slow | medium | high | low | low | slight | piping |
| Perryville | SC-SM<br>SM | moderate | medium | high | low | medium | slight to moderate | |
| Pinal | ML<br>SM | moderate | | high | low | | slight to moderate | |
| Rock Outcrop | | | | | | | | |
| Toltec | ML<br>CL | moderate<br>slow | medium | high | moderate | low | slight | piping |
| Tremant | SC/GC<br>SM/SC | moderate slow | medium | high | low | medium | slight to moderate | |
| Trix | CL | moderate slow | medium | high | low | medium | slight | |
| Tucson | ML<br>CL | moderate slow | medium | high | low | medium | slight | |
| Valencia | SM<br>CL | moderate rapid<br>moderate slow | low | high | moderate | medium | slight | |
| Vecont | CH | slow | low | high | moderate | low | slight | piping |

(1) Refers to the ability of the soil in a natural or compacted condition to transmit water or air. Reported values do not account for lateral seepage.

(2) Rate of corrosion on uncoated steel is related to soil properties such as drainage, texture, total acidity, and electrical resistivity.

(3) Rate of corrosion on concrete is influenced mainly by sodium and magnesium sulfate content, but also by soil texture and acidity.

(4) Refers generally to the shear stress in a soil mass as a factor in determining ultimate bearing capacity, stability of embankments, pressure against retaining walls, etc

(5) Refers to the relative slope of a graded field or channel bottom at which erosion may occur.

(6) Refers to the ability of the soil to resist erosion in an embankment condition such as a dike or levee.

### *Soil Conditions*

Soils formed in recent and old alluvium are predominant in the study area. A tremendous amount of information from the SCS soil survey of Maricopa County was presented in Soil Conditions, and key elements from that Section are summarized in Table 4 for easier cursory evaluation of improvement alternatives. Elements included in the table are: SCS soils series, Unified Soils Classification System soil classification, natural and compacted permeability, risk of corrosion for uncoated steel and concrete, compacted shear strength, and natural erosion hazard and susceptibility of compacted soil to piping. Because of its limitations, information from the SCS survey should only be used for general evaluation of shallow improvement alternatives.

Mapped soils in the study area vary from fat clays (CH) to silty gravels with sand (GM). With respect to natural and compacted permeability, reported characteristics agree with geotechnical theory; granular and non-plastic soils have moderate to high permeabilities, and fine-grained and plastic soils have moderate to low permeabilities. Agreement with geotechnical theory was also reported with respect to compacted shear strength and susceptibility to piping; granular and well-graded soils have higher shear strengths than fine-grained and poorly graded soils, and fine-grained soils are commonly susceptible to piping. Natural erosion risk was slight for most soils, but increased to moderate for some soils because of slope. The risk of corrosion was high for uncoated steel for almost all soils and low for concrete for most soils. However, variations from this pattern were reported, and corrosivity should be evaluated for alternatives this characteristic may affect. Calcareous soils, cobbly soils, hardpan, and shallow bedrock were also reported in some soil series and should be considered during the evaluation process, especially with regard to excavatability.

### *Geotechnical Summary*

A review of topographic, geologic, groundwater, and surface and near-surface soil and rock properties was performed on the basis of literature and field research. No field sampling or laboratory testing was performed for this review.

Depth to groundwater may be a limiting factor in very deep excavations for large diameter storm drains, or for very deep basins or channels, particularly those close to the Salt River. Uncoated steel in contact with the soil will have a reduced life and should be protected. The use of concrete pipe and concrete structures is preferred, with adequate depth of cover over reinforcing steel. Engineered fill slopes will be subject to erosion and should not be left unprotected.

Prior to design of any specific improvements, a field investigation and report should be prepared to determine specific soil properties.

## SOCIOECONOMIC CONSIDERATIONS

The information contained in this section was obtained from interviews with staff members representing City of Phoenix, Maricopa County, Gila River Indian Community, Maricopa Association of Governments (MAG) and FCDMC.

### *Regional And Local Context*

Laveen is a district roughly bounded by 19th Avenue, the Salt River, South Mountain Park and the Gila River Indian Reservation. The study area roughly follows the boundaries of the Watershed and steps over to the 7th Street alignment at the ridge line of South Mountain south of Central Avenue. The City of Phoenix and Maricopa County have jurisdiction within the Laveen area. Because the area is bounded on three sides by the City of Phoenix, and because as development occurs annexation into the City is preferable, the County respects the City of Phoenix plans in Laveen.

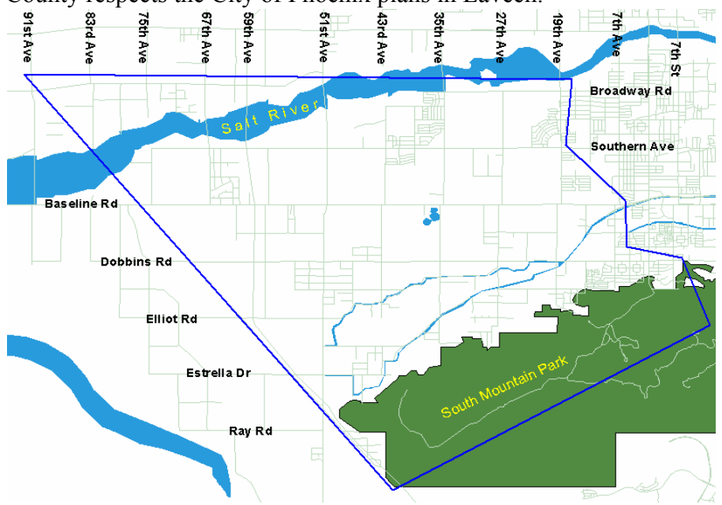



Figure 2-50: Laveen ADMP study area

### *Existing Social And Economic Environment*

Despite it's proximity to downtown Phoenix, the study area has remained somewhat isolated from the rest of the Valley. Separated by the Salt River to the north, the Gila Indian Community to the west and South Mountain to the south, and the low income areas of South Phoenix to the east, the area has retained much of its rural character and population through today. Consequently, the average study area resident has a lower median family income and is more likely to be Hispanic or another minority than Maricopa County or Phoenix residents. Slightly more than half the population is between 20 and 55 years old.

*Census Tracts:*

Eleven census tracts are included in the study area. Census estimates were developed using all of the information from tract 116601, and weighted information from other tracts, based on the amount of land area included in each tract. Although the City of Phoenix and Maricopa County participated in the 2000 census, data from this effort is not yet available.

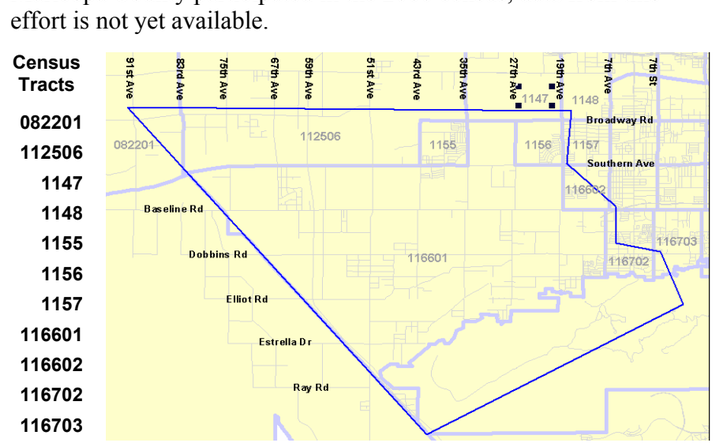



Figure 2-51: Census Tracts

Source: U.S. Census, 1990 Census Tracts

*Income*

The average median family income in the study area is $22,031 or 66% of the Maricopa County average of $33,474. Because the study area includes a portion of South Phoenix outside Laveen (from 19th Avenue East of Southern Avenue), the study area median family income is also lower than that of Laveen and Phoenix residents.

Laveen residents reported a 1989 average household income of $32,880; Phoenix residents reported an income of $39,159 in 1989. Substantial new development has occurred in the area since 1989, and is ongoing, and current incomes are likely to more closely resemble those of the greater Phoenix area.

*Ethnicity*

The study area is more ethnically diverse than the overall Maricopa population (see chart). Using 1990 Census data, over three-quarters of the study area population identifies themselves as Hispanic or other, as compared with the City of Phoenix which is 53% Hispanic or other minority. The study area ethnicity does not substantially differ from that of the Laveen area.

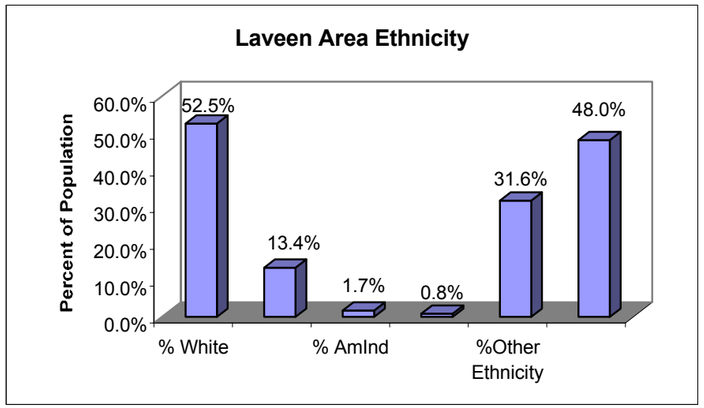



Figure 2-52: Ethnical Diversity for Laveen ADMP study area

*Age Distribution*

Over half the study area population is between 20 and 54 years old. The study area population has a significantly larger youth (ages five to 17 years old) population and a slightly smaller middle aged (25-44) population than the City of Phoenix as a whole. There are also significantly less older (65-84 years of age) residents in the study area than the City of Phoenix. The study area population is similar to that of the Laveen area.

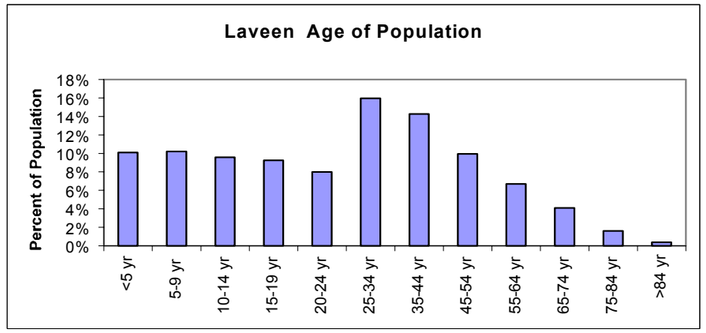



Figure 2-53: Age Distribution for Laveen ADMP study area

*Population Trends*

Over the next 20 years, the population in the study area is projected to quadruple. Most of the population growth is anticipated to occur west of 27th Avenue as a result of the construction of the Southwest Loop along 61st Avenue. The largest increases in persons is projected to occur after 2010.

Table 5: Study Area Population Projections 1995 - 2020

| Year | 1995 | 2000 | 2005 | 2010 | 2015 | 2020 |
|---|---|---|---|---|---|---|
| Population | 18,495 | 21,028 | 29,816 | 37,823 | 59,290 | 83,741 |
| Percent Change | | 13.7% | 41.8% | 26.9% | 56.8% | 41.2% |

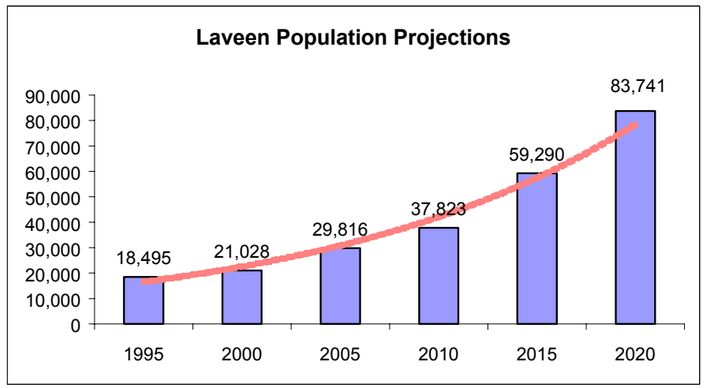
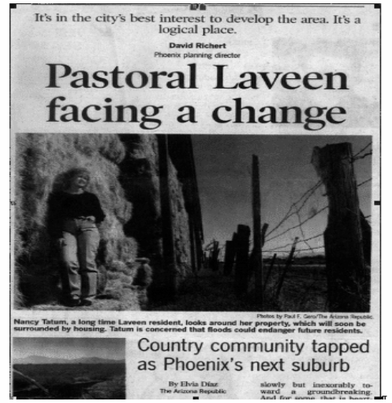



Figure 2-54: Laveen ADMP study area population projections for 1995-2020

Source: MAG Socio-Economic Projects (1997)

*Housing*

Housing growth is commensurate with population growth, with the number of units quadrupling over the next two decades and the largest increases in housing growth occurring after 2010.


It's in the city's best interest to develop the area. It's a logical place.
David Richert
Phoenix planning director
Pastoral Laveen facing a change
Photos by Paul F. Gero/The Arizona Republic
Nancy Tatum, a long time Laveen resident, looks around her property, which will soon be surrounded by housing. Tatum is concerned that floods could endanger future residents.
Country community tapped as Phoenix's next suburb
By Elvia Diaz
The Arizona Republic
slowly but inexorably toward a groundbreaking

Source: The Arizona Republic

Table 6: Laveen Area Housing Unit Projections 1995 - 2020

| Year | Housing Units | Percent Change |
|---|---|---|
| 1995 | 5,663 | |
| 2000 | 6,453 | 14.0% |
| 2005 | 9,462 | 46.6% |
| 2010 | 12,234 | 29.3% |
| 2015 | 19,710 | 61.1% |
| 2020 | | 43.6% |

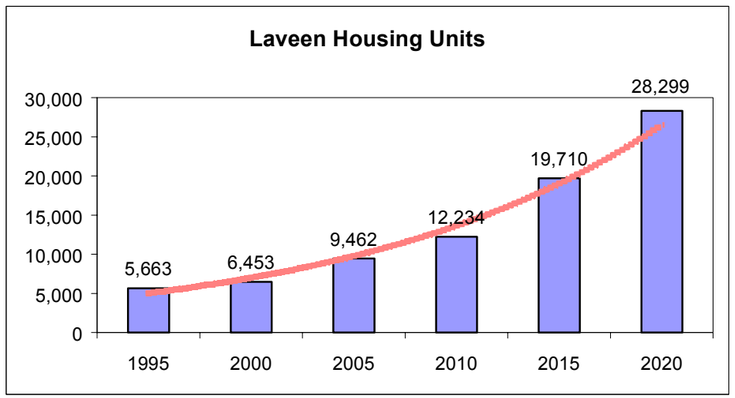



Figure 2-55: Laveen ADMP study area housing projections 1995-2020

Source: MAG Socio-Economic Projects (1997)

*Employment projections*

The study area will continue to be an exporter of jobs. The 2020 job to population ratio is projected to be 0.1 as compared to the current job to population ratio of 0.78. This is probably a result of the anticipated change from a rural to a more suburban environment. The job to population ratio in study area is substantially lower than Maricopa County and Phoenix.

Table 7: Laveen Area Employment Projections 1995 - 2020

| Year | 1995 | 2000 | 2005 | 2010 | 2015 | 2020 |
|---|---|---|---|---|---|---|
| Employment | 4,010 | 5,065 | 6,320 | 7,454 | 8,425 | 9,136 |
| Percent Change | | 26.3% | 24.8% | 17.9% | 13.0% | 8.4% |

***Socio-Economic Summary***

The Laveen area's isolation from Phoenix is reflected in the resident's socio-economic data. According to 1990 Census information, average incomes represent only 66% of the median Maricopa County family income, the population is younger than that of the greater Phoenix area, and over three-quarters of Laveen residents are Hispanic or other minority.

The most dramatic change facing Laveen in the next twenty years will undoubtedly be growth; the population in the area is expected to quadruple by the year 2020 to 83,741. Housing units in the area will see an even larger increase with a total of 28,299 units expected by the year 2020 (Maricopa Association of Governments Socio-economic Projections, 1997.)

## OPPORTUNITIES AND CONSTRAINTS

Many opportunities and constraints have been identified during the course of performing the Existing Conditions Analysis phase of the ADMP. These include opportunities and constraints related to partnering with specific stakeholder interests, multi-use opportunities for joint facilities, and addressing community-based concerns.

During the Alternatives Formulation Phases, and other subsequent phases of the ADMP, several issues will be critical to incorporating the opportunities and constraints into the implementation of ADMP. These issues are summarized below:

- The ADMP process provides the opportunity to work with land developers and concerned citizens as a stakeholder group to provide community-based solutions to potential flooding problems in advance of future development. This is a significant shift from reactive flood control measures, which attempt to solve flooding problems after development has occurred.

  A constraint to the process may be identifying alternatives that address possible conflicting goals of developers and concerned citizens. As in most urbanizing areas, pro-development and anti-development forces have valid concerns to about the nature and character of any infrastructure improvements.

- The Laveen Area Conveyance Channel being advanced by the FCDMC will be the primary outfall for the Laveen area and gives the opportunity to combine within that right-of-way multiple-use recreation and open space with active and passive flood control features.

  As the primary outfall, it establishes the major drainage pattern of the watershed and therefore constrains to some extent the location of other drainage infrastructure elements. The alignment of the channel may be difficult to combine with potential ties to trails that would interlink the area to areas such as South Mountain Park.

- The Gila River Indian Community constitutes a political boundary on the downstream side of the study area. Two of the three major watersheds in the study area currently outfall across the Reservation. The opportunity exists to work with the Gila River Indian Community to help mitigate flows in the study area without negatively impacting downstream properties.

  Constraints do exist in acquiring Right-of-Way across allotted lands on the Reservation, and on addressing other issues such as public access for multi-use facilities. Working within these constraints is not without precedent, however, and should not be viewed as constituting a solid barrier between off-reservation and on-reservation flood control solutions.

- ADOT has proposed a corridor for the future South Mountain Transportation corridor that currently is projected to parallel a portion of the downstream side of the study area, and continue north near the alignment of 63rd Avenue. The transportation corridor would be elevated on embankment. The drainage system for the transportation corridor would include a drainage channel on the upstream side of the transportation corridor that would intercept offsite flows. Although timing may be critical, an opportunity exists to advance the planning of the ADOT drainage system and include it as an element of the Laveen ADMP. This could bring about a possible cost sharing agreement.

  Because planning for the transportation corridor is at such an early stage, there would be some risk involved in sizing and locating a flood control facility that would serve a multi-use purpose of protecting the transportation corridor. Due to the safety concerns associated with an urban transportation corridor, there may be limitations on multi-use opportunities in this corridor if combined with ADOT.

- COP and MCDOT have planned improvement projects along 51st Avenue from Baseline Road to Elliot Road. Similar past projects have included funding contributed by FCDMC for the inclusion of storm drains that would serve as flood control and transportation corridor drainage conveyance. The opportunity exists for project coordination with the COP, MCDOT, and FCDMC in these projects. Significant flows could be collected and conveyed to the north in this option that can outfall to the Laveen Area Conveyance Channel.

  Several improvement projects are due to go to construction very soon and time constraints will become critical very quickly.

- SRP irrigation delivery ditches and irrigation drain ditches are prevalent throughout the study area. During storm events, these facilities impede flows as well as receive drainage. Current SRP practice is to open all gates to allow these to drain and not impede storm flows. The opportunity exists of tying these facilities to any planned storm drains or channels to allow conveyance of storm flows. In the areas where no aggressive development plan exists such as Carver Mountains and South Mountain, this option is more feasible since the existing ditches will not likely be converted to piped drains.

  There may be potential permitting and operational constraints associated with directly connecting SRP laterals and ditches to municipal storm drain facilities.

- The Southwest Area Growth Study/Laveen has recommended locations for desired trailheads at South Mountain Park and for river access trailheads along the Salt River. The opportunity exists to place drainage collection points in the locations of the desired trailheads for connection to South Mountain Park are for 27th Avenue, 35th Avenue, and Estrella Drive, and to place drainage outfall locations along the Salt River in the recommended locations for river access trailheads, also as specified in the Southwest Area Growth Study/Laveen, which are 27th Avenue, 43rd Avenue, and 71st Avenue.

  The constraint surrounding these specific locations is that they may not be hydraulically efficient. For example, a trailhead located for access to South Mountain Park may be too high in the watershed to serve as an effective detention basin.

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# PART 3. ALTERNATIVES FORMULATION

## OVERVIEW

A one-day Alternatives Formulation Workshop was held on February 1, 2001, in order to explore options for providing multiple purpose stormwater management facilities in the Laveen area. The workshop was a professionally facilitated meeting and included nearly 40 invited participants with knowledge of the Laveen area. Participants had expertise in the fields of engineering, hydraulics, hydrology, environmental, open space and land use planning or landscape architecture or represented the interests of public entities (such as the City of Phoenix, Maricopa County, Gila River Indian Community, ADOT), a service provider or a Laveen resident.

To help assure that a wide range of multiple purpose opportunities were included in the planning of the stormwater management system, four functional groups were established to consider and address specific conditions. Ideas and opportunities within each of these functional areas were developed in pre-meetings, prior to the workshop, and presented as "seed ideas" at the workshop to the entire group. The four functional areas were defined as Engineering, Multiple-Use, Landscaping and Environmental. The seed ideas that were developed as a result of the pre-meetings are described in sections below.

Figure 3-1: Goal building session at Alternative Formulation Meeting

## FUNCTIONAL AREAS

The stakeholders assembled for the Alternatives Formulation Meeting represented a wide variety of disciplines. In order to ensure attendance of the proper stakeholders, it was decided to limit the meeting to a one, eight-hour day session. Several days prior to the Alternatives Formulation Meeting, the stakeholders assembled in smaller groups, sorted by discipline or interest, to establish the "seed" ideas for those with common interests and goals. This would start off the meeting with determined goals for each area.

The disciplines represented were:

**Engineering** – Hydrology, hydraulics, civil, geotechnical, agricultural irrigation, utilities, right-of-way
**Multi-Use** – Recreation planning, land use planning, equestrian
**Landscape** – Landscape architecture, visual analysis
**Environmental** – Biology, archeological, hazardous materials, permitting.

### *Engineering Seed Idea Pre-Meeting Summary*

Team members involved in the engineering functional area for the Laveen ADMP met and discussed the information discovered during the existing conditions analysis. Elements of existing conditions within the engineering sphere included:

- The flood control district hydrologic model results,
- The data collected regarding land use and land forms,
- Information obtained through contact with local residents,
- Comments recorded at public meetings and via phone calls,
- And, data from agencies that manage the area.

A map based on the information developed from the existing conditions analysis helped to focus the group on the problem areas. The different flooding areas were analyzed based on the various hydrologic models. These models included the South West South Mountain (SWSM), the Hidden Valley (HV) and the Maricopa Drain (MD) watersheds. The flooding problems were identified within each watershed and several options for minimizing flooding and providing flood protection were discussed.

Very few flooding issues were identified in the SWSM watershed. The largest flooding concern is the likely residential development on an alluvial fan in one of the southernmost sub-areas. Most of this sub-area is within the South Mountain Park boundary. Solutions discussed to resolve this situation included building a large detention basin to limit flows reaching private lands. The next concept was to expand the alluvial fan channel to include a channel along the reservation boundary to collect all of the flows produced by the SWSM watershed and convey them out of the area. The conceptual outfalls for this channel included either continuing the channel westerly through the reservation, or possibly incorporating a pump station to lift the flows to a channel leading to Dead Horse Ditch or to the Laveen Area Conveyance Channel.

The HV watershed has a major unnamed wash at the bottom of the valley. Adjacent to this channel and along this channel is where the notable problems exist for the HV watershed. The upstream portion of the channel receives storm water flows from small collector washes that convey the flows from the mountains to the upper wash location. These collector washes cross Carver Road in various locations causing road flooding. From this point the wash traverses though private land, mostly developed with desert landscape or left natural, until it reaches Carver Road again. At this point, the wash is directed at two homes on the south side of Carver Road. These homes have experienced past flooding problems as indicated by the small earthen berms surrounding them to direct storm flows around the homes. The water then flows through a group of rural or ranchette homes eventually reaching Estrella Road and flowing west to the reservation boundary. The engineering functional group developed several concepts for conveying the storm water around these homes in a channel and discharging it to the existing channel that leads to Dead Horse Ditch or to a channel leading to the Laveen Area Conveyance Channel. A basin near 47th Avenue and Estrella Road, upstream of 51st Avenue, would regulate peak flows entering the reservation.

The MD watershed, the watershed that drains to the Laveen Area Conveyance Channel, is the largest watershed in the project. The South Phoenix/Laveen Drainage Improvement Project and Laveen Area Conveyance Channel Project provided solutions for a majority of the flooding problems. Remaining flood problem areas were evaluated by the engineering functional group. Problem areas include the historical Laveen area on southeast corner of the intersection of 51st Avenue and Dobbins Road. Various locations in this section have been flooded due to low areas, raised canals or ditches and elevated roadways. Other areas with notable flooding problems include 67th Avenue between Baseline Road and Southern Avenue, the intersection of 51st Avenue and Baseline Road, and the intersection of 51st Avenue and Elliot Road. The group concluded that seed ideas for preventing flooding in the areas would include storm drains for roadway flooding including 67th Avenue and the intersections of 51st Avenue with Baseline and Elliot Roads. A collector channel, maybe upstream of the Western Canal, would collect flows off of Carver Mountain and discharge into basin(s) in the undeveloped portions of Laveen east of 47th Avenue, south of Dobbins Road. These basins and storm drains could be discharged directly to the Laveen Area Conveyance Channel or taken to the west and intercepted by a channel along the reservation boundary, eventually discharging to the Laveen Area Conveyance Channel.

During discussion of the various options, the group took into account the implication of the proposed Loop 202 Transportation corridor alignment through the middle of the Laveen ADMP study area. The transportation corridor location is subject to change and will not be constructed until some time in the future. The systems proposed by the group could be easily modified to fit within the plans for the ultimate transportation corridor location. The current proposal for transportation corridor off-site drainage is to locate a collector channel on the upstream side of the transportation corridor to collect and convey the flows away from and through the alignment.

***Multi-Use Seed Idea Pre-Meeting Summary***

The objective of this functional group was to develop concepts and ideas that could incorporate multiple use opportunities into the Laveen Area Drainage Master Plan alternatives. General information on current and underway plans in the Laveen area were reviewed and presented. Participants discussed these plans, and agreed to the following principles that were used to guide the development of four alternative sets of seed ideas:

- Co-locate basins and channels that integrate existing plans:
  - Watercourse Master Plan
  - Phoenix General Plan Trails (i.e. Baseline-Dobbins Scenic Drive)
  - Parks obtained through zoning dedications and Southwest Area Plan parks policies
  - Maricopa Trail (Sun Circle Trail)
  - South Mountain Park Master Plan (Trailheads)
  - River Plans (Rio Salado, El Rio)
- Incorporate the Western Canal.
- Incorporate the Laveen Area Conveyance Channel.
- Connect rivers to mountains (using flood control and other features).
- Use an approach that minimizes the impacts of trails to existing and planned project design.

Based on these principles, the seed ideas were developed. These ideas are intended to provide a framework for presenting recreation opportunities. The group felt that the final Area Drainage Master Plan recommended alternative would likely contain elements from many, if not all of the seed ideas.

*Multi-Use Only Seed Ideas*

These ideas are based on thinking about recreation as the most important element to guide planning and stormwater management decisions in the Area Drainage Master Plan.

The seed ideas based on this premise would include:

- Trails and recreation features that are compatible with equestrian use.
- Emphasis on :
  - Sun Circle Trail/Maricopa Trail.
  - Salt River and Gila River connections to other trails/recreation.
  - Access to South Mountain Park.
  - Connections to Gila River Indian Community.
  - Connections to county parks (via other trail systems).
  - Golf courses incorporated into open space areas used for flood control/stormwater management.
  - New neighborhood parks.
  - Equestrian facilities as a part of flood control facilities.

*Southwest Area Plan Seed Ideas*

The Southwest Area Plan, adopted in 1998, reflects the values and desires of Laveen residents. Because it is an adopted document, and incorporates other, adopted plans and is part of the City's General Plan, a set of seed ideas that implemented the goals of this plan were developed. They include the following elements:

- Trails and recreation features that are compatible with equestrian use.
- Emphasis on:
  - Sun Circle Trail/Maricopa Trail
  - Salt River to Gila River connections
  - South Mountain
  - New neighborhood parks.
  - Equestrian facilities combined with flood control.
  - Retain views of mountains (the Estrellas, South Mountain, Carver Hills).
  - Restore the Salt River corridor.
  - Using water features to remind us of and represent natural elements such as washes.
  - Preserving the agricultural character of Laveen.
  - Rural recreation activities.
  - Preserving historic and prehistoric land uses and features (for example, a planted area representing crops, windbreaks or vegetated promenades).

***Landscape Seed Idea Pre-Meeting Summary***

The focus of the Landscape functional group was based on developing seed ideas that would incorporate characteristics appropriate for the Laveen environment and visual character.

The ideas developed provide the essential elements that the functional group considers to be imperative in the development of alternatives for the Laveen ADMP. They are classified in two major areas and should be considered as an outline of elements to be used in coordination during the development of alternatives.

*Natural Systems Elements*

These elements were predicated on preserving and restoring natural systems as the guiding framework for developing a stormwater management approach for the Laveen Area Drainage Master Plan. The key features include:

- Salt River and Gila River connections
- South Mountain Park
- Carver Hills
- Wildlife habitats (potential is significant)
- Preserve the views of the mountains (Estrellas, South Mountain and Carver Hills)
- Restoring the Salt River corridor
- Using water features to remind us of and represent natural elements such as washes

*Cultural Elements*

Culture in this context was viewed as the equestrian emphasis of the community, it's rural feel imparted by the farms, open views and linear landscapes, and low development densities. The elements presented here are intended to preserve these cultural features of the community. They include:

- Preserving views of city, farms, silos/bars/cotton gins and canals Designing flood control to incorporate exiting features
- Trails and recreation elements that are compatible with equestrian use

- Emphasis on:
  - Sun Circle trail.
  - Gila River Indian Community.
  - Providing equestrian facilities as a part of flood control.
  - Preserving the agricultural character of Laveen.
  - Rural recreation activities.
  - Preserving historic and prehistoric land uses and features (for example, a planted area representing crops, windbreaks or vegetated promenades).

***Environmental Seed Ideas Pre-Meeting***

The purpose of the group meeting was to develop those environmental concepts and elements that could be incorporated into the Laveen ADMP alternatives. Team members involved in the environmental functional group discussed the information discovered during the existing condition analysis. Elements of the existing conditions within the environmental influence include:

- Fish and Wildlife Service list of threatened and endangered species.
- Arizona Game and Fish list of species of concern and special status species.
- Hazardous-material database information.
- Archaeological surveys and data collection.
- Section 404 discharge into waters of the U.S.
- Data from agencies within the area.

In the process of determining flood control alternatives for the Laveen ADMP, avoiding impacts was the general goal. In addition, alternatives must be evaluated based on either "minimizing" and/or "mitigating" those impacts when avoidance is not practicable. The environmental group agreed to bring a mutual consensus of actions on some definite issues and apply a broad-brush approach in order to keep the group sensitive to those issues/needs when the preferred regional flood control alternative becomes selected.

*Biological Seed Ideas*

Most all the native desert vegetative community has been replaced by vegetation indicative of the agrarian lifestyle in the Laveen study area. The natural vegetation as it currently exists is so discontinuous that it does not support well-defined wildlife corridors within the study area. The environmental group believes the integration varied-use, wide-corridor alternatives into the new flood control features would enhance or at least maintain the wildlife in the area and certainly not lead to further habitat degradation. As the area becomes even more urbanized these multi-use opportunity corridors can serve as buffers and habitat for those same species that are in place now.

Elements of these ideas were predicated on preserving or enhancing native desert vegetation whenever possible. Several of the ideas will be adopted based on the success of activities that are currently being undertaken on other Flood Control District projects. One such activity is the placement of manmade burrows to entice burrowing owls like those along the proposed Laveen Area Conveyance Channel.

The district may choose to purchase additional acreage outside the channel or right-of-way limits to leave as agricultural land allowing for fallow fields that some of the wildlife are associated with or even allowing for local community garden plots. Where practicable, in the invert areas of low flow channel, plans could allow for larger flow capacities, which would allow for greater diversity of vegetation, subsequently greater wildlife diversity. Finally, the use of non-structural alternatives when possible would create esthetically softer features that are more pleasing to humans and wildlife alike.

*Archaeological Seed Ideas*

One of the main environmental issues that should be anticipated consists of features, which are not visible or readily visible in the area today. To gain a better understanding of what features may be anticipated, review of existing archaeological survey maps took place to determine those areas that have already been surveyed. The surveys generally tend to be along roadway alignments or other linear corridors. Only a small amount of land within the drainage area has been surveyed and the potential for cultural resources is high based on the area's proximity to previously identified archaeological sites.

It is the general consensus that this area was probably widely inhabited in prehistoric times based on the proximity to the confluence of the Salt River and Gila River immediately west of the area. Furthermore, known historic canals that have been recorded in the area and three major prehistoric villages were also documented. The general areas the three prehistoric villages occupied are known, however, actual delineation of these villages has not been conducted.

Based on the environmental framework, an attempt to locate an alignment directly through a known archaeological site should be avoided. When practicable, aligning the flood control features along existing corridors or alignments (roadway, canals) would generally mean fewer disturbances to the area. A reevaluation is recommended for those areas surveyed in 1987 along 51st Avenue for the ADOT South Mountain corridor. While avoidance is the primary goal, incorporating significant features into a diverse educational/ recreational function could constitute some of the mitigation measures that would be required if the selected alternative affects cultural sites.

*Hazardous Materials Seed Ideas*

No major hazardous-materials sites were located within the project area, therefore none are likely to impact the recommended alternative. Even a few sites identified in the database search, which tend to be concentrated around 51st Avenue and Dobbins Road, would not likely affect the alternatives.

A more thorough evaluation would be required if property transactions for an acquisition of a building or residential home would take place. It is not uncommon for illegal drug labs to have been set up in many areas of the valley including the Laveen ADMP study area. Also, older buildings/homes may have asbestos containing material or lead base paints, which must be properly identified and handled. It would be incumbent on the buyer to perform their due diligence before acquiring any property.

*Section 404 Seed Ideas*

The Section 404 Clean Water Act implication is minimal. The potential for permits is most likely along the 67th Avenue right-of-way or possibly across the Gila River Indian Community. The actual type of permit required, whether Nationwide or Individual, can not be determined until final designs are developed.

**ALTERNATIVES FORMULATION WORKSHOP**

The Alternatives Formulation Workshop was divided into three activity segments:

- Information sharing and presentation of seed ideas developed in the functional group pre-meetings.
- Identification of planning goals.
- Development of alternatives.

## Information Sharing and Presentation of Seed Ideas

A representative of each functional group provided a brief overview of their respective topic area and identified the most exciting opportunities and challenges they believe existed in their specific discipline. The overview included facts that were determined to be critical to providing multiple use flood control facilities in the Laveen study area.

## Identification of Goals, Objectives and Policies

A planning goal is a desired condition. It is very general, and speaks to the basic needs that are to be addressed. An objective is a desired level of achievement or measurable step towards achieving a goal.

A policy is a step that could be taken by the District, the City of Phoenix, or another entity to reach the objectives and achieve its goals.

The Alternatives Formulation Workshop participants were asked to identify those factors that they felt were important to be considered in creating an Area Drainage Master Plan, that protected the public from the hazards of flooding, served multiple purposes and improved the quality of life for Laveen residents. The following factors were identified:

Figure 3-2: Planning factors are identified

Core Factors (must be included in any alternative)

- Provide flood control.
- Implementable (realistic).
- Fundable.
- Operations & Maintenance.

***Planning Factors***

- Plan and design flood control facilities to meander and achieve natural appearance.
- Avoid co-locating facilities in utility corridors.
- Integrate and connect with planned and existing trail and recreational systems and provide new facilities where necessary.
- Work with GRIC for mutual benefits and integrate GRIC storm water issues into the plan.
- Preserve views and vistas to the mountains.
- Consider utility impacts and below surface infrastructure.
- Meet needs/desires of Laveen citizens.
- Protect, enhance, and create wildlife corridors.
- Coordinate planning with the planned transportation corridor (Loop 202) corridor.

Figure 3-3: Goals are developed from planning factors

***Design/Engineering Factors***

- Evaluate non-structural solutions, purchase flooded areas, and maintain as retention.
- Design structures to allow vegetation to grow in inverts, basins, channel banks, etc.
- Design to be consistent with existing and future land use.
- Store water out of SRP canals or enlarge canals to handle storm water.
- Incorporate wildlife habitat into solutions.
- Design structures and facilities that minimize operations and maintenance.
- Explore the potential/capacity for the subsurface disposal of water.
- Consider the potential for shallow groundwater in the area.

***Construction Factors***

- Obtain sufficient ROW to integrate aesthetic features.

***Implementation/Funding Factors***

- Cost-effective, ability to fund.
- Conduct historic building surveys and protection plan, avoid historic and pre-historic sites.
- Preserve and maintain agricultural land and character.
- Post usable maps to identify wildlife habitat areas, major natural flow patterns, and historic areas to developers and engineers with ease of access.

## Development of Alternatives

Once the goals were identified, the participants were assigned to groups at tables ranging from five to seven members. The groups were structured so that a variety of experts were included at each table. Each group was asked to develop alternative concept Area Drainage Master Plans that accomplished as many of the factors as possible. A total of 18 plans were developed during this process.

Figure 3-4: Presentation of conceptual alternatives

When the alternatives developed at each table were presented to the entire 40 person audience, the following key considerations emerged:

- The Plan can establish a drainage pattern for Laveen that will be considered in other projects (e.g. 202 Transportation corridor) – All the groups felt that the ADMP was an important opportunity to establish a long-term drainage pattern for the area.
- A potential to work with ADOT exists to use a channel to protect the transportation corridor.
- There is a need to find a corridor that minimizes impact to individual allotted lands on the Gila River Indian Reservation.

All of the groups recognized the potential for Laveen to impact the Gila River Indian Community. They all worked on drainage solutions that would have the least impact to this entity.

- There is a potential for Gila River Indian Community agricultural lands to develop. All of the groups recognized that current plans on the Gila River Indian Community adjacent to Laveen were for agricultural uses. However, everyone also recognized that this is a well-located area, and that these plans could change, especially with the improved access provided by the transportation corridor and the land tenure pattern on the GRIC.

The following features were generally reflected in most of the plans:

- Basins at trailheads – Retention basins were considered opportunities to provide trailheads identified in the South Mountain Park Plan and Southwest Area Growth Study.

- No changes to drainage patterns associated with the alluvial fan at South Mountain - Many alternatives displayed the consensus that the existing development patterns and the proximity to South Mountain Park merited a non-structural approach to this area.

- Channel/Trail/ Wildlife corridor along GRIC boundary with the City Of Phoenix – The Sun Circle Trail follows the transmission line easement along the GRIC boundary with the City of Phoenix. Because of the historic importance of the Sun Circle Trail, and current County efforts to implement it, most plans identified this as an important trail corridor that could be compatible with a drainage corridor.

- Use Western Canal, Telegraph Pass as drainage and/or trail corridors – The SRP laterals on the north and south sides of the Carver Hills are known as the Western Canal and Telegraph Pass Canal, respectively. Both of these laterals are identified in the Southwest Area Growth Study and other plans as trail corridors. They are also important because they are raised features, and have an impact on stormwater flows. These laterals were seen as excellent locations for drainage corridors that could also provide trail corridors.

- Convey flows along 67th Avenue north to the Salt River – 67th Avenue is a low spot and is perpendicular to the Salt River. Most alternatives felt that it was a cost effective and appropriate solution to convey water from the high point north along 67th avenue through a channel or pipe to the Salt River.

- Vegetation promenade along Dobbins Road – The Laveen Watercourse Plan, the Southwest Area Growth Study and the Phoenix General Plan identify Dobbins Road as a part of the Baseline-Dobbins Scenic Drive. The Laveen Elementary School, which has experienced significant flooding, is located at 51st Avenue and Dobbins Road. Many alternatives recommended creating a multiple purpose drainage corridor along Dobbins Road that would alleviate flooding at the school and implement the scenic drive.

- Basins at Laveen Elementary School at 51st and Dobbins/ new town core – The Laveen Watercourse plan recommends that the Laveen Core be relocated east from 59th Avenue to 51st Avenue and Dobbins Road. The core is intended to be pedestrian friendly. A basin could be used to meter flows from Dobbins Road as well as provide an open space amenity that could lend character to the new town core.

- Parks/Schools Basin combinations – Basins were located at schools to increase opportunities for open space and recreation resources for the school and community.

- Wildlife corridors along drainage corridors – Drainage corridors were identified as opportunities to provide wildlife corridors between the South Mountains and Gila River. Both of these resources provide substantial wildlife habitat and provide connections to other habitat areas.

- Channel out of Hidden Valley Watershed (Hidden Valley Scenic Dr.) – The Dead Horse Ditch on the Gila River Indian Reservation provides a drainage channel to the Gila River. This is a logical route for water conveyed along the Phoenix/Gila River Indian Community Border.

- Routing channels through Laveen core – The Baseline-Dobbins Scenic Drive is viewed as a significant design element of the Laveen Core. The location at Dobbins Road and 51st Avenue is a low spot and floods frequently. Drainage corridors along Dobbins Road were viewed as opportunities to implement the scenic drive and enhance the core.

- Use planned off-site drainage system along the Loop 202 Transportation corridor – The planned Loop 202 will have off-site drainage systems along it. These systems were viewed as opportunities to remove stormwater without providing additional facilities.

- Open channels with trails – Almost every alternative considered drainage corridors as an opportunity to provide trail corridors throughout the community. Many of the channels were designed to complement the planned trails system.

- Buying homes in Hidden Valley to preserve and restore natural wash – Hidden Valley is rife with homemade drainage solutions that have downstream impacts.

The 18 alternatives developed and presented during the Alternatives Formulation Workshop can be summarized as follows:

<u>Alternative 1:</u>
The Southwest South Mountain (SWSM) basin was given a "no action" status. The Telegraph Pass basin would be studied and any flooded homes would be purchased to allow the land to naturally convey the flows. A storm drain along 51st Avenue to the Laveen Area Conveyance Channel with two detention basins was the primary feature. The 67th Avenue basin was a storm drain along the roadway towards the Salt River.

<u>Alternative 2:</u>
This alternative included a linear retention basin for the SWSM watershed with a pump station to convey flows to the north into a channel that parallels the Gila River Indian Reservation (GRIC) border. The Telegraph Pass basin would include channels within the basin to a detention basin at its base and a pipeline to the west towards the channel along the GRIC border. This option also included connection of trailheads to the South Mountain area. The central area included a detention basin at 45th Avenue and Dobbins Road that conveys flows westerly to a detention basin at approximately 55th Avenue serving as a regional amenity. The flows then go due west to the channel along the GRIC border. 67th Avenue includes a detention basin with a storm drain north to the Salt River.

Alternative 3:
This alternative included a basin for the SWSM watershed with a pipeline to the west towards the Gila River. The Telegraph Pass area would have a basin at its base and a pipeline to 51st Avenue where a storm drain flows to the south. There would be two detention basins along 51st Avenue, one at Dobbins Road and another at Baseline Road. At 67th Avenue there would be a detention basin with a pipeline north to the Salt River.

Alternative 4:
This alternative includes a basin at the SWSM watershed with a channel to the west towards the Gila River. The Telegraph Pass area would have a channel through its reach that ties to a basin at its base. A channel then meanders south to Dobbins Road where it meets two channels that circle the Elliot/Dobbins area with a detention basin near Dobbins and 45th Avenue. The channel would combine soft and hard bottoms compatible with equestrian and pedestrian uses. The channel would continue south parallel to 51st Avenue to a detention basin at Baseline Road before being tied to the Laveen Area Conveyance Channel.

Alternative 5:
No action was recommended at the South Mountain alluvial fan. A storm drain or channel would parallel the Loop 202 Transportation corridor with multiple use amenities. At Carver Hills, the natural wash would be restored and homes would be bought. Lateral 12.8 would branch out into two separate channels at approximately 35th Avenue with the southern branch heading west to the Gila River along Elliot Road. This channel would have two basins, one at approximately 43rd Avenue and one at approximately 47th Avenue. Carver Wash will be restored and the existing homes within that area are to be purchased.

Alternative 6:
Under this alternative, the South Mountain alluvial fan area is to be preserved. Create proposed "Hidden Valley Channel" as an extension of Lateral 12.8 headed southwesterly to Estrella Road and draining to a channel along the GRIC boundary, South Mountain/Gila River Recreational Corridor. This channel along the GRIC will serve as a wildlife corridor with islands (habitat sites). The town core or Laveen Town Recreational Complex would be located at the southwest corner of 43rd Avenue and Dobbins Road. A channel, Dobbins Road Promenade Channel, heads west from the Recreational complex along Dobbins Road toward the GRIC boundary. At 67th Avenue, a storm drain or channel will drain flows south to the Laveen Area Conveyance Channel.

Figure 3-5: Presentation of conceptual alternatives

Alternative 7:
This alternative proposes a channel along the GRIC boundary towards the Salt River. A multi-use channel, the Maricopa County Regional Trail Channel Corridor, will follow the Western Canal alignment passing through the Laveen Recreational Complex located at approximately 43rd Avenue and Dobbins Road. The proposed Hidden Valley Channel would connect to the GRIC boundary with a recreation node located at the connection. In addition, a recreational node will also be located at the town core located at approximately Olney Road and GRIC boundary. A third recreational node will be located at the Laveen Area Conveyance Channel and the GRIC boundary.

Alternative 8:
Basins are proposed at the South Mountain trailheads with parking facilities (see Figure 3-6) and a new trailhead is proposed at South Mountain and GRIC border. Two additional basins will be located at the east and west bases of Carver Hills. A canal connects these basins and drains to the GRIC boundary where another canal is located. SRP canals south of Carver Hills would be extended/ enhanced to convey storm flows.

Alternative 9:
This alternative includes a channel along the Loop 202 Transportation corridor including equestrian, hiking/pedestrian, and storm flows (see Figure 3-6). A basin at the Laveen Elementary School is also proposed.

Alternative 10:
A channel along the GRIC boundary is proposed with a wildlife corridor. A golf course used for detention is proposed at Baseline Road between 51st and 59th Avenues. Schools are to be utilized for detention.

Alternative 11:
Basins are proposed at the South Mountain trailheads with parking facilities. A canal and trail along Carver Hills wash connects the trailheads. SRP canals are to be extended/enhanced south of Carver Hills towards GRIC boundary and around the "Conservation Community". The town core located at 51st Avenue and Dobbins Road includes a basin and a park. A channel parallels the Loop 202 Transportation corridor. Additional channels including wildlife corridors will connect the South Mountain trailheads to the Salt River trailheads.

Alternative 12:
This alternative proposes a channel along the GRIC boundary from a high point located at the southern portion of the boundary to the Salt River. Another channel is proposed at 51st Avenue headed westerly along Dobbins Road to GRIC boundary. This channel passes through the Laveen town core providing multiple-use amenities. A storm drain system along 51st Avenue from Olney Road to the Laveen Area Conveyance Channel conveys storm flows along 51st Avenue. An additional storm drain along Olney headed west to 51st Avenue ties into this system. At 67th Avenue, a storm drain will convey flows north to the Salt River. At the SWSM watershed, a channel draining west into the Gila River conveys storm flows.

Alternative 13:
This alternative proposes to extend/enhance SRP laterals to convey storm flows. Highline canal branches out and connects to the GRIC border. A canal runs along the GRIC border to the Salt River.

Alternative 14:
SRP canals are to be extended/enhanced to convey storm flows. A channel extending from the Western Canal heads west towards the Gila River along Elliot Road. A channel is proposed along Dobbins Road headed west to the GRIC boundary. A storm drain extends from 43rd Avenue to 51st Avenue along Dobbins Road to the canal. An additional storm drain along 51st Avenue south of Olney Road towards Dobbins Road ties in. At 67th Avenue, a storm drain conveys flows north into the Salt River.

Alternative 15:
Channel upstream of the SRP canal (see detail) runs from a basin located at the mining site (Carver Hills). An additional basin is proposed at the Cheatum property (47th Avenue and Elliot Road). An open channel system including scenic elements is proposed along Hidden Valley watershed connecting detention basins and planned school (also used for detention). The open channel system connects

to the Loop 202 Transportation corridor at approximately 57th Avenue and Dobbins Road where another basin is located. The transportation corridor will consist of a trail system that will connect the South Mountain trailhead with the Salt River trailhead, which will be moved to 67th Avenue.

Alternative 16:
This alternative focuses on providing detention facilities where possible. Town core will be located at 59th Avenue and Dobbins Road. Basins will be located at the town core, Baseline Road and 51st Avenue, Dobbins Road and 51st Avenue, Cheatum property, east and west bases of Carver Hills, and 43rd Avenue and Estrella Road. The basins at Carver Hills will be connected to the SRP laterals at the base of Carver (Telegraph Pass area). A trail/open channel system connects the town core to the Highline Canal.

Alternative 17:
This alternative follows the natural flows based on open channel systems. South Mountain is to be preserved (establish policies). A channel is proposed from South Mountain headed west towards the Gila River. Homes along Carver Road would be purchased. An open channel system (including trail system) would extend from 43rd Avenue and Carver Road to the Gila River. An additional channel will connect the Western Canal to the Laveen Area Conveyance Channel past the town core. Another channel will convey flows from 57th Avenue and Olney Road to the Laveen Area Conveyance Channel. 67th Avenue would be raised to ground level to prevent flooding.

Alternative 18:
This option protects SRP canals, provides parks, and re-establishes the natural drainage of the area. The SRP laterals (Telegraph Pass and Lateral 12.8) will be enhanced to convey storm flows and provide trails. Three basins will be located around the Telegraph Pass area. One at Carver Road between 35th and 43rd Avenues, another at Estrella Road and 43rd Avenue, and a third at Estrella Road and 47th Avenue. These basins are connected to the SRP canals, which will drain to the transportation corridor channel. A basin will be located at the town core with a connection to another basin just east of it. A channel running northwesterly from a basin at the Cheatum property (47th Avenue and Elliot Road) connects to the Laveen Area Conveyance Channel. Two other basins will be located at 51st Avenue and South Mountain Avenue and South Mountain Avenue between 67th and 75th Avenues.

**Combined Alternatives**

Many of the 18 concept alternatives developed in the Alternatives Formulation Workshop had features in common with each other. In order to reduce the number of concept alternatives to a manageable number, a core team with representatives from each of the functional groups combined the common elements of the concept alternatives and produced six formal alternatives. A digital sketch of each of the resulting six formal alternatives was produced, along with a narrative description. These are represented on the following pages.

**PUBLIC PARTICIPATION**

A public open-house meeting was held on February 20th, 2001 to present the six formal alternatives to the public. The Alternatives Formulation process of the Area Drainage Master Plan was described in a second newsletter. The six formal alternatives were also presented to the Laveen Village Planning Committee and to the Gila River Indian Community's Vee Quiva Casino Board of Directors for informational purposes.

***Alternative 1 – Linear Concept***

This alternative mainly uses drainage channels within multi-purpose right-of-ways to achieve flood control. The drainage channels would be shallow and wide with a defined low-flow channel. The channel bottom and side slopes treatments would be compatible for multi-use purposes and probably support a system of multi-use trails and other linear recreational opportunities.

The linear, multi-use channels would divert flows to the west of the upper two watersheds. One channel would run parallel along Carver Hills just upstream of the Western Canal, and eventually outfall to Dead Horse Ditch. A second channel will run through the Telegraph Pass area, west to Estrella Drive. Areas on the south side of South Mountain Park would continue to cross the Gila River Indian Reservation boundary as it currently does.

Another multi-use channel would run along Dobbins Road from 43rd Avenue, then west to the Gila River Indian Reservation. It would continue north, outfalling to the Laveen Area Conveyance Channel as part of a Dobbins Road Scenic Drive.

A focus of this alternative is that the multi-use channels are tied into the South Mountain Park trailheads using some fashion of detention basin or stormwater collection feature. Raising the grade of 67th Avenue to match surrounding grades would control flooding. Storm flows would then be channeled north to the Salt River.


Figure 3-6: Alternative 1 – Linear Concept

Figure 3-7: Typical Cross-section

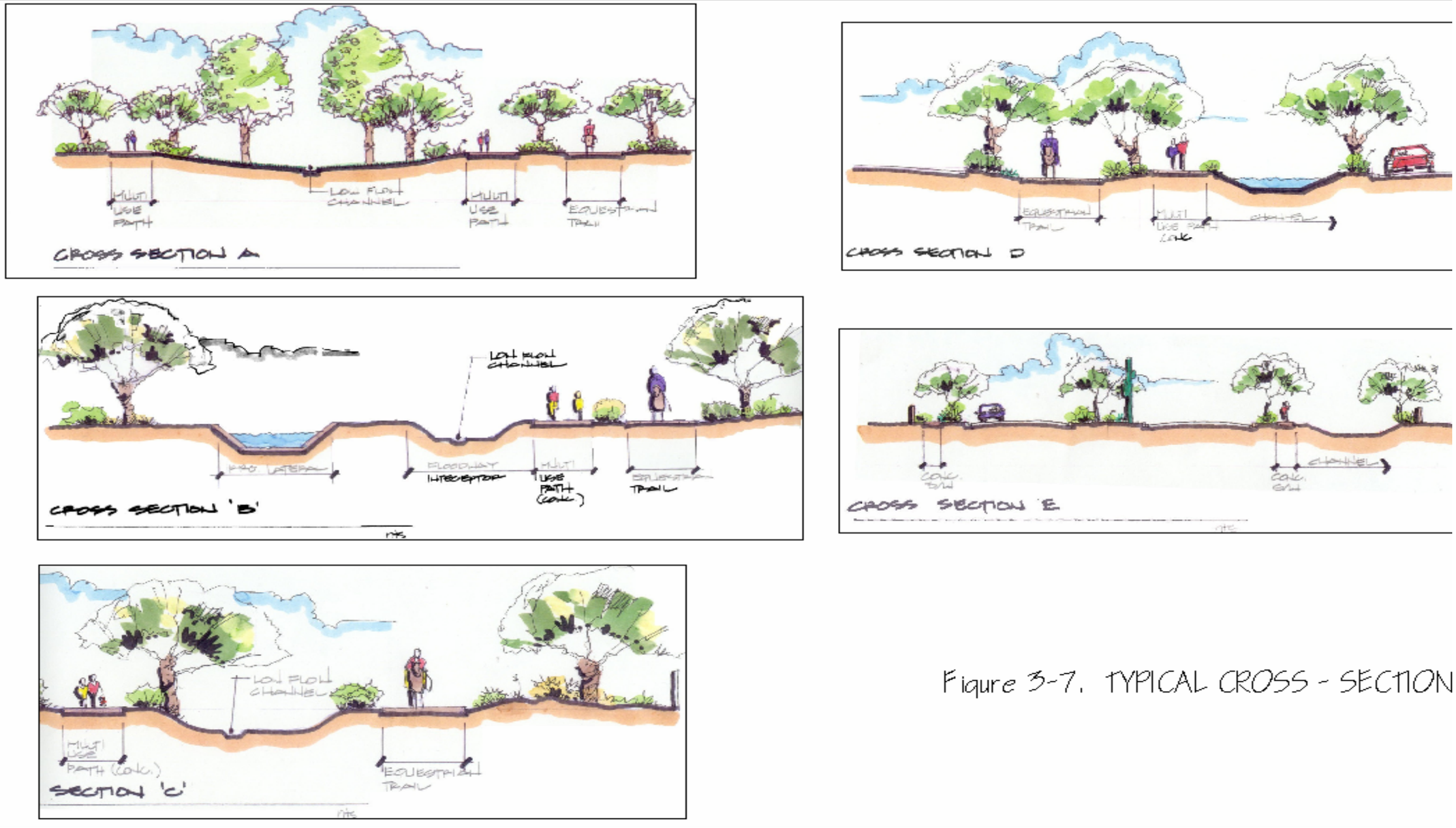



Figure 3-7. TYPICAL CROSS - SECTION

***Alternative 2 – "Break the Grid"***

This alternative breaks the traditional grid established by the street system, allowing multi-use drainage channels to meander, providing for more parks and amenities. The alignments shown tie the stormwater system to the Laveen Core area while not being confined to the roadway alignments. The multi-use channels through the Laveen Core at Dobbins Road will serve to enhance the Dobbins Road Scenic Drive between 51st and 59th Avenues. Flows then continue along Dobbins Road to the Gila River Indian Reservation boundary, then north to the Laveen Area Conveyance Channel.

Flooding along 67th Avenue is controlled by piping or channeling north to the Salt River, or south to a proposed detention basin as an amenity to a planned school.

The South Mountain Park watershed area would continue to flow south across the Gila River Indian Reservation boundary as it currently does.

***Alternative 3 – Detention Basins***

This alternative uses a combination of multi-use drainage channels and multi-use detention basins. The addition of detention basins at selected locations will serve to reduce peak flows, thus allowing the width of the drainage channels to be downsized. The downsized drainage channels could either outfall to the Laveen Area Conveyance Channel or to the drainage system included in the proposed Loop 202 transportation corridor.

Multi-use channels will follow along Dobbins Road, the Western Canal, Telegraph Pass, and the proposed Loop 202 transportation corridor. Stormwater from the south side of South Mountain Park will be collected in a detention basin, and pumped to the proposed Loop 202 drainage system.

Storm flows along 67th Avenue will be collected and from a high point in the system, will be either piped north to the Salt River or south to the Laveen Area Conveyance Channel within a local storm drain system.


Figure 3-8: Alternative 2 – "Break the Grid"


Figure 3-9: Alternative 3 – Detention Basins

***Alternative 4 – Storm Drain Concept***

This alternative focuses on the use of a network of street catch basins and storm drains to collect, control and convey floodwaters. Strom drains will be located north along 51st Avenue, outfalling to the Laveen Area Conveyance Channel, and west along Dobbins Road, outfalling to the proposed Loop 202 drainage system. A storm drain along 67th Avenue could outfall either to the Salt River or to the Laveen Area Conveyance Channel. Detention basins would be located in the existing Laveen area to collect flows before being metered to the storm drains.

Multi-use channels and a possible detention basin would collect flows along the Western Canal and along Telegraph Pass. The Western Canal Channel would flow west to a storm drain in Elliot Road and then north to the Laveen Area Conveyance Channel. The Telegraph Pass Channel would flow west to Estrella Drive, continuing to a storm drain which outfalls across the Gila River Indian Reservation boundary and channeled west to the Gila River.

Floodwaters from the south side of South Mountain Park will be collected and channeled west to the Gila River.

***Alternative 5 – "No Action"***

No structural flood control projects would be built with this alternative. Only the Laveen Area Conveyance Channel, built with developer participation, would be in-place to serve flood control needs. All existing flood control policies currently enacted by the City of Phoenix and the District would assume to be in force.

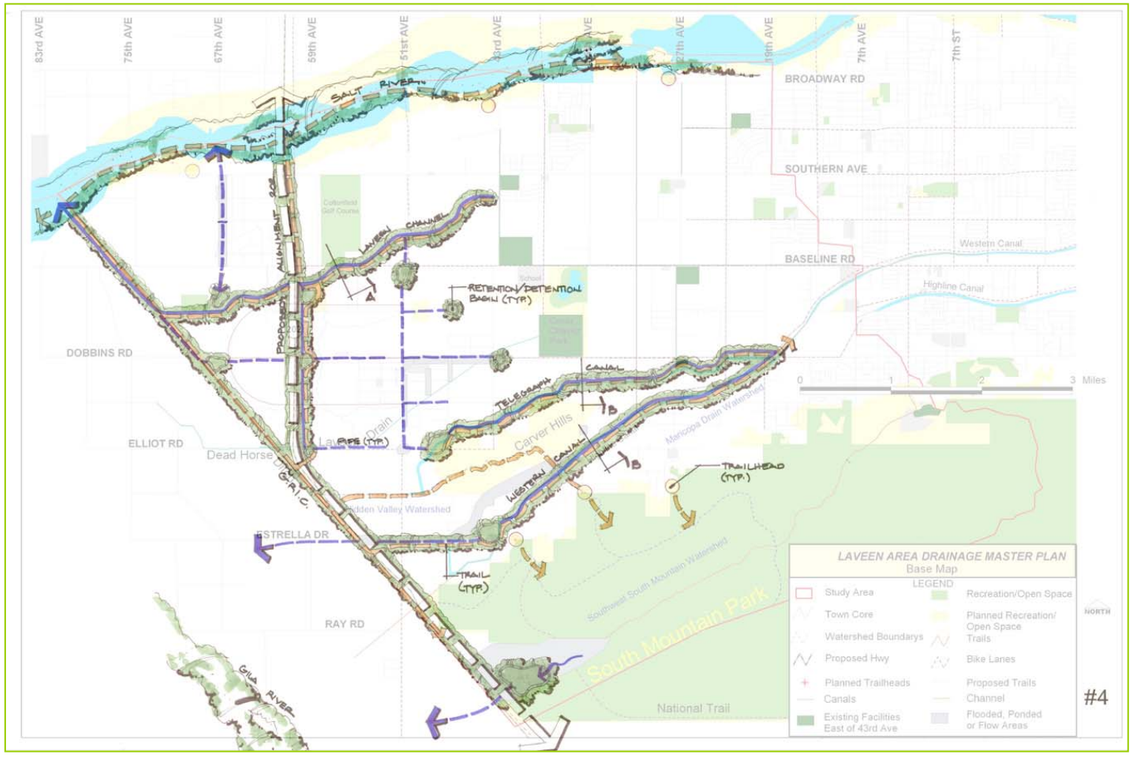



Figure 3-10: Alternative 4 – Storm Drain Concept

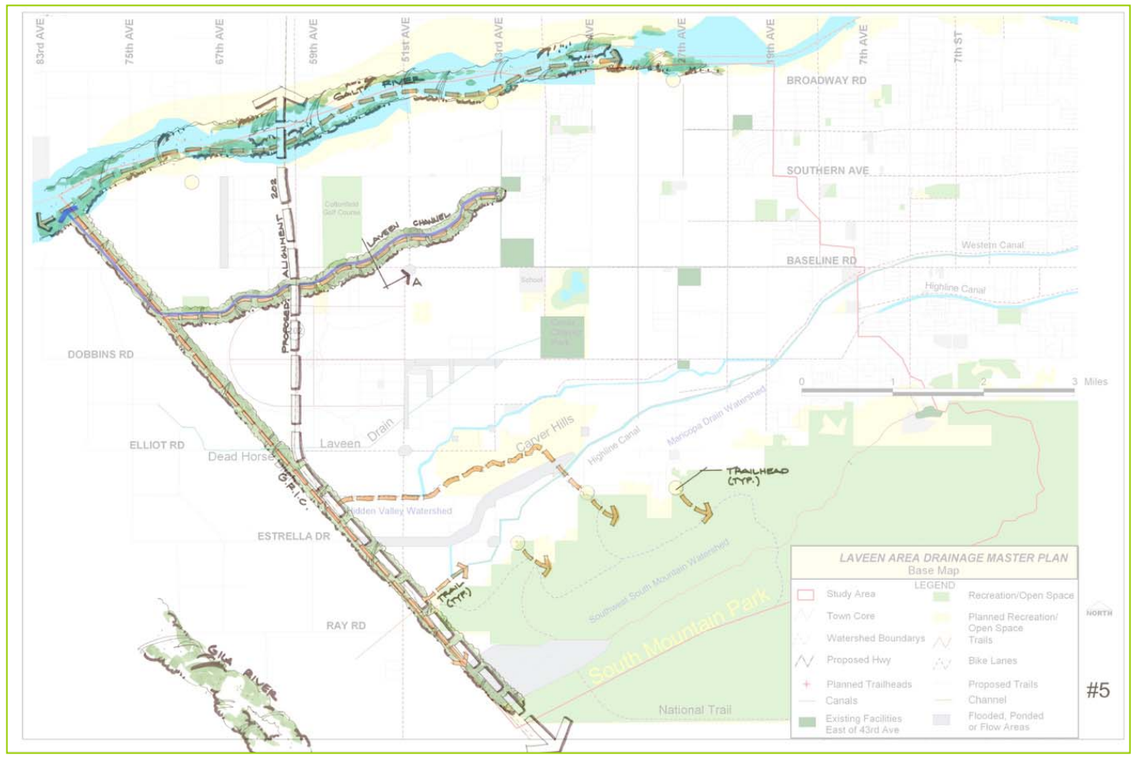



Figure 3-11: Alternative 5 – "No Action"

***Alternative 6 – Minimum Structural***

With this alternative, only the minimum amount of improvements necessary to provide regional flood protection would be built. The opportunities for multi-use trails, parks, and other recreational and aesthetic enhancements would be minimized.

Storm drains will be constructed within the Laveen Core area to convey flows to 51st Avenue, then north to the Laveen Area Conveyance Channel protecting the Laveen Elementary School and the existing Laveen area. This system would also include a detention basin at 51st Avenue and Baseline Road to detain flows and reduce the peak discharge to the Laveen Area Conveyance Channel.

A collector channel behind the Western Canal would convey flows to basins near 43rd and 47th Avenues to protect flooding areas identified from 43rd Avenue to 51st Avenue.

Flows from along Telegraph Pass would be conveyed through either a storm drain or an open channel to a detention basin, ultimately outfalling to an existing channel.

**EVALUATION CRITERIA**

For each functional group, a number of goals and objectives were defined based on discussions from previous meetings and the Alternatives Formulation Groups. These goals served as the basis for developing the evaluation criteria by which the combined alternatives would be assessed. The major goals for each functional area included:

Environmental Considerations:

- Protecting, enhancing, and/or creating wildlife corridors
- Incorporating wildlife habitat into designs
- Protecting historic sites
- Maximizing protection of listed threatened and endangered species
- Minimizing 404 issues

Engineering Considerations:

- Providing localized and regional flood protection
- Providing flood protection for SRP system
- Providing flood protection GRIC
- Designing cost-effective and implementable solutions
- Minimize utility impacts
- Incorporating designs that allow vegetation growth
- Consistency with existing land use, planned parks, schools, and amenities
- Incorporate SRP canals
- Incorporate 202 Transportation corridor
- Minimizing operations and maintenance
- Developer needs

Multiple-Use Considerations:

- Meeting the needs of Laveen citizens
- Integration/ connections with existing/ planned trails
- Providing new trails and recreational opportunities
- Coordination with GRIC for mutual benefits
- Integration with City of Phoenix projects
- Coordination with future needs for open space

Landscape Considerations

- Preserving views and vistas to the mountains
- Preserving agricultural land and character
- Maintaining the equestrian character
- Preserving vegetative promenades
- Preserving character of Carver Hills

For these criteria, each alternative was evaluated based on how well they achieved the goal determined by the functional groups.

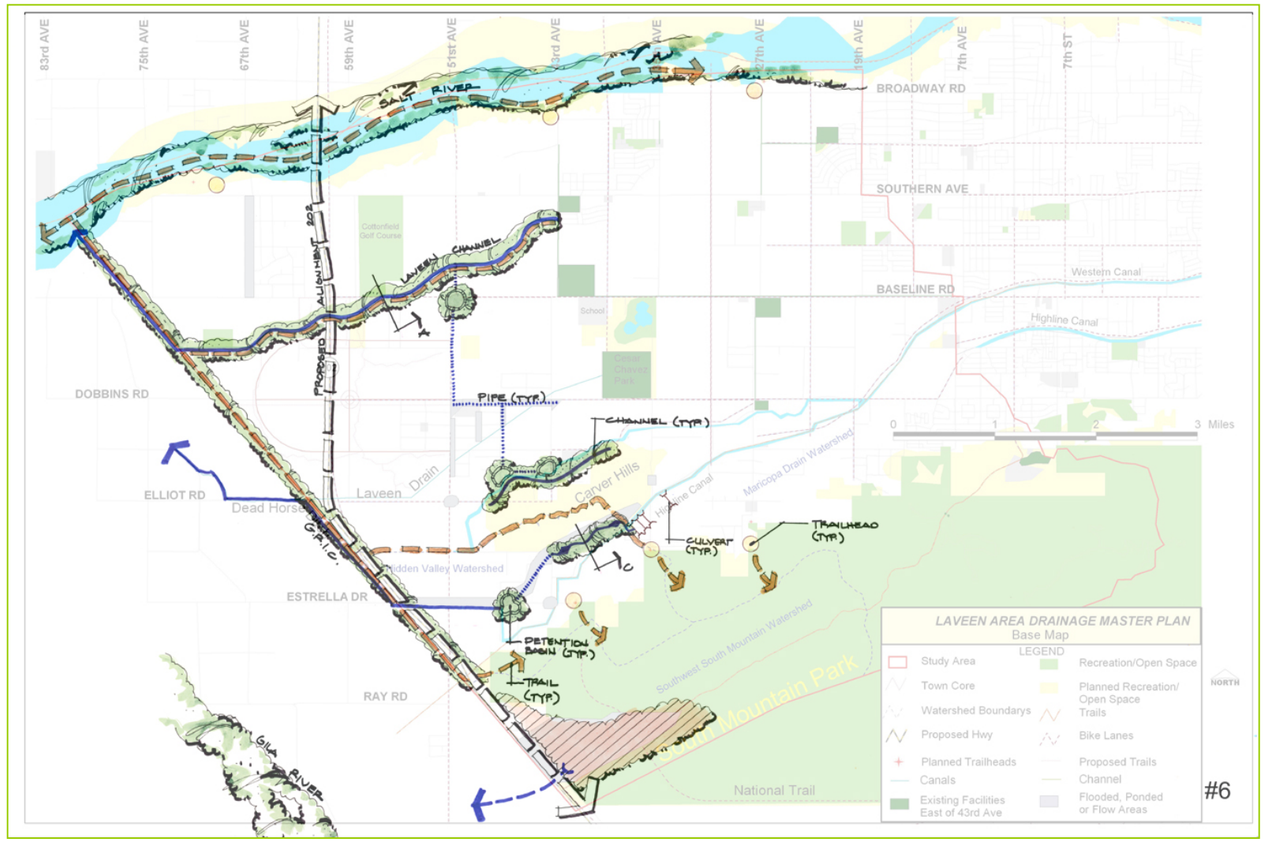
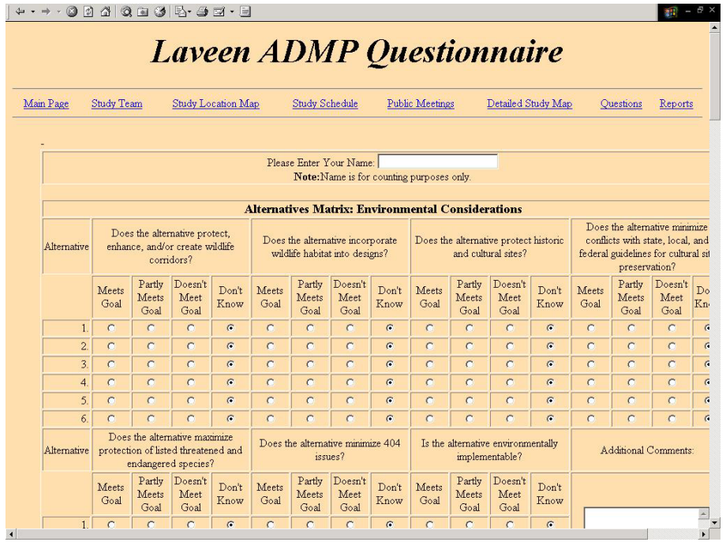



Figure 3-12: Alternative 6 – Minimum Structural

## MATRIX SURVEY

A matrix was developed to evaluate each of the six combined alternatives based on the evaluation criteria. This format facilitated further comparisons among the alternatives. Each of the participants from the Alternatives Formulation Workshop was provided with web-based survey to evaluate the six alternatives. The survey was formatted using the evaluation matrix. Each participant was asked to determine whether the alternative met the goal, partly met the goal, did not meet the goal, or they did not know. In addition, they were offered the opportunity to provide comments for any of the functional areas. An excerpt of the web-survey is shown in Figure 3.12.



**Laveen ADMP Questionnaire**

Main Page | Study Team | Study Location Map | Study Schedule | Public Meetings | Detailed Study Map | Questions | Reports

Please Enter Your Name:
**Note:**Name is for counting purposes only.

**Alternatives Matrix: Environmental Considerations**

| Alternative | Does the alternative protect, enhance, and/or create wildlife corridors? | | | | Does the alternative incorporate wildlife habitat into designs? | | | | Does the alternative protect historic and cultural sites? | | | | Does the alternative minimize conflicts with state, local, and federal guidelines for cultural st preservation? | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Meets Goal | Partly Meets Goal | Doesn't Meet Goal | Don't Know | Meets Goal | Partly Meets Goal | Doesn't Meet Goal | Don't Know | Meets Goal | Partly Meets Goal | Doesn't Meet Goal | Don't Know | Meets Goal | Partly Meets Goal | Doesn't Meet Goal | Do Kn |
| 1. | | | | | | | | | | | | | | | | |
| 2. | | | | | | | | | | | | | | | | |
| 3. | | | | | | | | | | | | | | | | |
| 4. | | | | | | | | | | | | | | | | |
| 5. | | | | | | | | | | | | | | | | |
| 6. | | | | | | | | | | | | | | | | |

| Alternative | Does the alternative maximize protection of listed threatened and endangered species? | | | | Does the alternative minimize 404 issues? | | | | Is the alternative environmentally implementable? | | | | Additional Comments: |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Meets Goal | Partly Meets Goal | Doesn't Meet Goal | Don't Know | Meets Goal | Partly Meets Goal | Doesn't Meet Goal | Don't Know | Meets Goal | Partly Meets Goal | Doesn't Meet Goal | Don't Know | |
| 1. | | | | | | | | | | | | | |

Figure 3-13: Screen capture of web-based survey

A summary of the results of the web-based questionnaire is presented under each of the following functional areas.

### *Environmental*

Based on the environmental goals, Alternatives 1 and 2 (Linear Concept and "Break the Grid", respectively) were considered to be the most favorable. These alternatives, being based on open channels, provide more opportunities to create wildlife corridors and habitats.

As expected, the overall results of this section revealed that Alternatives 4, 5, and 6 (Storm Drain Concept, No Action, and Minimum Structural) are the least preferable environmentally. Due to the limited open channels and amenities provided in these alternatives, they do not provide as many opportunities to enhance or create habitat or wildlife corridors. These alternatives, along with the others were considered to meet other environmental goals to a high extent such as being environmentally implementable and minimize regulatory issues.

In the area of cultural preservation, all alternatives were considered to meet the goals to a certain extent.

### *Engineering*

Alternatives 4 and 6 were most favorable for meeting the goals in the engineering considerations. All the alternatives (except for Alternative 5, No Action) are considered to meet the main goal and fundamental purpose of the project, which is providing localized flood control. In the areas of regional flood control and flood protection for SRP, Alternatives 1 and 2 were the most favored. However, in meeting the goal of providing flood protection to the GRIC, Alternatives 3 and 4 were the most favored.

Alternative 6 was preferred for minimizing operations and maintenance as well as maximizing the use of the Laveen Area Conveyance Channel. All other alternatives, except for Alternative 5, No Action, partly met these goals.

**Multi-Use**
Based on multiple-use considerations, Alternatives 1, 2, and 3 were very well favored. They provide recreation opportunities, multiple use amenities, and coordinate with planned and existing recreation opportunities such as trails and parks. Of the action alternatives, the Minimum Structural Alternative, or Alternative 6, was the one that was considered not to meet some of the multiple use goals. Due to the maximization of the 202 Transportation corridor and the Laveen Area Conveyance Channel, this alternative does not provide for many new open channels or multiple use opportunities at the Laveen town core.

**Landscape**
For all the action alternatives, the Landscape goals were considered to be met with the exception of integration with existing dairies. It can be noted that Alternative 4 was not as well favored as the other action alternatives in the area of preserving the agricultural land character.

## SUMMARY OF ALTERNATIVES

After tabulating the results of the web-based survey, a score was assigned to each functional area by normalizing the total responses for each alternative. A graphical representation of the survey results, based on this methodology, is depicted on the following figure.

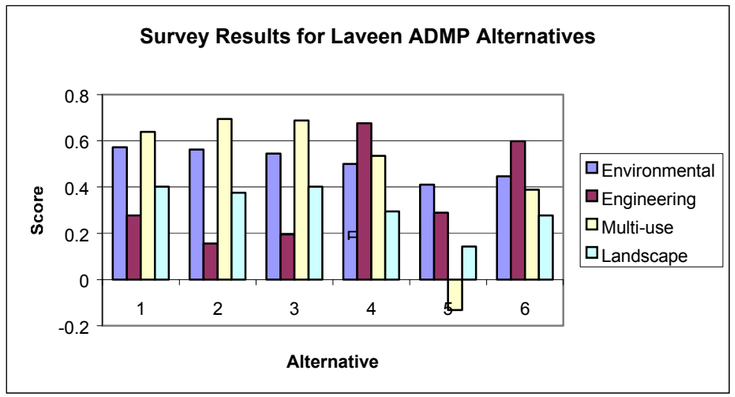



Figure 3-14: Survey results

From this graph, it can be observed that each alternative has its own relative strengths and weaknesses within each of the functional categories. Alternative 5, the "No Action" alternative did not seem to meet many of the key elements within the functional areas of concern. By providing many open channels and amenities, Alternatives 1, 2 and 3 seemed to be preferable within the Environmental, Multiple Use, and Landscape functional areas. Conversely, Alternative 4 was considered to excel in achieving the Engineering goals when compared to any of the other alternatives.

From these results, it can be concluded that a combination of the major features among the action alternatives would have to be considered in order to meet most of the goals established by the functional groups. Within the existing alternatives, Alternative 4 currently combines many of the key elements from the other alternatives and was ranked highest when the scores all functional areas are combined. Within later sections of the ADMP, the alternatives to be carried further in analysis will evolve from the combination of key elements observed in the six combined alternatives developed in this section.

## COMPARATIVE STRENGTHS AND WEAKNESSES

### *Alternative 1 – Linear Concept:*

*Strengths:*

- This alternative meets many of the Environmental goals by protecting, enhancing or otherwise creating wildlife corridors and habitats in the open channels.
- Within Engineering, this alternative not only meets the required flood protection goals for Laveen, SRP, and GRIC, but also allows for growth of vegetation at the channel inverts.
- With the many open channels in this alternative, the most of the Multiple-use goals are met including integration to existing trails and providing new trails.
- By providing open space amenities this alternative can be designed to achieve the Landscape goals of maintaining the agricultural and land character of Laveen while preserving the views and vistas to the mountains.

*Weaknesses*

- This alternative has few weaknesses but some may be pointed out within the engineering considerations such as higher operations and maintenance requirements, and being very structurally intensive.

### *Alternative 2 – "Break the Grid":*

*Strengths:*

- As with Alternative 1, this alternative includes many open channels that provide wildlife habitats and corridors, allows vegetation to grow at inverts, and provides for Multiple-use opportunities.
- This alternative also maximizes the use of the Laveen Area Conveyance Channel.

*Weaknesses:*

- With this concept of "Breaking the Grid", the alternative does not maximize the Loop 202 Transportation corridor corridor, consider shallow groundwater, or minimize operations and maintenance requirements.

### *Alternative 3 – Detention Basins:*

*Strengths:*

- The detention basin concept in this alternative provides many Multiple-use opportunities and meets much the same Environmental goals as was observed for Alternatives 1 and 2. Additionally, the integration of detention basins with local parks and school sites makes for additional recreational opportunities.
- This alternative also provides the most direct flood control benefits for the GRIC.

*Weaknesses:*

- Within the Engineering considerations, this alternative is operations and maintenance requirement intensive and has not allowed for the possibility of shallow groundwater.

### *Alternative 4 – Storm Drain Concept:*

*Strengths:*

- This alternative meets most of the Engineering goals by providing flood protection, minimizing operations and maintenance, incorporating the SRP canals and the 202 Transportation corridor, and maximizing the use of the Laveen Area Conveyance Channel. Operation and maintenance efforts are minimized.
- In addition, this alternative provides new trails and considers future trails along the Laveen commercial corridor.

*Weaknesses:*

- This alternative does not provide Multiple-use opportunities at the Laveen core.
- Some Environmental goals are met, but to a smaller degree than with Alternatives 1, 2 and 3.

### *Alternative 5 – "No Action":*

*Strengths:*

- A "No Action" alternative is very low cost and does not require implementation of any new policies.

*Weaknesses:*

- The major weakness of this alternative is that it does not meet the key goal of the Laveen ADMP, which is to provide flood protection.
- No Multi-use opportunity goals are met with this alternative.

- While some Environmental and Landscaping goals are accomplished with this alternative, they involve protecting existing characteristics, such as avoiding historic and cultural sites, but the alternative does nothing to encourage new habitats or views and vistas.

***Alternative 6 – Minimum Structural:***

*Strengths:*

- This alternative meets most of the Engineering goals and objectives by providing flood protection, being implementable and cost-effective, maximizing the use of the Laveen Area Conveyance Channel, and minimizing operations and maintenance.
- Some Environmental, Multi-use, and Landscaping goals can be met with the alternative.

*Weaknesses:*

- This alternative does not provide significant wildlife corridors, connect with existing or planned trails, or integrate Multi-use opportunities at the Laveen core.

**OPPORTUNITIES**

The Gila River Indian Community lies downstream of the entire study area. Almost all the flows, which are not captured by the Laveen Area Conveyance Channel, will eventually outfall across the Gila River Indian Reservation boundary. Some of these flows currently cause flooding at the Vee Quiva Casino. Great opportunity exists to coordinate with the GRIC to assure that the flood control solutions provided in the ADMP will be of mutual benefit. Beyond flood control, the opportunity also exists to coordinate, multi-use and environmental goals related to the interface between GRIC and non-tribal lands. While not all of the six alternatives formulated include the GRIC, it is anticipated that the next phase of work, the Alternatives Analysis, will include the GRIC considerations.

Likewise, there is significant opportunity to develop regional flood control solutions that incorporate the off-site drainage system for the planned Loop 202 Transportation corridor. ADOT is beginning to prepare an Environmental Impact Statement and a Design Concept Report for the transportation corridor. The results of those studies will not be known until after the completion of this ADMP study effort. Therefore, the preferred alternative should be flexible enough to allow for any changes to the current proposed transportation corridor alignment may come about as a result of the EIS and DCR projects. Successful coordination of these combined efforts may result in significant taxpayer cost savings and additional recreational opportunities that may not be there if the studies were completed without regard for the planning efforts of the other party.

The Laveen Core planning area has the potential to bring to Laveen employment and business opportunities that are compatible with residential development, but otherwise do not currently exist. The incorporation of a multi-use channel or other flood control feature into the Laveen core area could serve as a catalyst to encourage development at the Laveen core in the manner envisioned by city planners.

***Threats***

Each of the Alternatives presented in this section of the ADMP, assume that the Laveen Area Conveyance Channel is an existing condition. While the Laveen Area Conveyance Channel has not yet been constructed, it will serve as the primary outfall for the major watershed in the study area. If for whatever reason the Laveen Area Conveyance Channel project is not constructed, the success of the Laveen ADMP could be threatened.

A significant measure in determining the success of this ADMP will be the willingness of the various funding partners to contribute to both the primary flood control and the secondary multi-purpose aspects of the project. While one of the responsibilities of the ADMP to identify an implementation strategy and prepare an implementation plan, there is no assurance that any major funding partner may choose not to participate in a timely manner, thus threatening the success of the plan.

***Trends***

Development is rapidly occurring in the study area. The need for regional flood control solutions for Laveen, while not currently at a critical level, will become more and more important as population increases over the planning horizon.

Development pressures will drastically alter existing demographics and land uses. The demand for parks, schools, recreation sites, and open space, consistent with residential development, is likely to build. The public demand for regional flood control facilities will however, lag behind the demand for multi-use facilities, as these quality of life issues confront people more often than their rather infrequent flood control needs. Continuing to focus on multi-use opportunities and environmental goals, as a way of achieving public acceptance of flood control projects, is a positive trend.

# PART 4. ALTERNATIVES ANALYSIS

## INTRODUCTION

The purpose of the Alternatives Analysis portion of the ADMP is to further refine the alternatives developed in the Alternatives Formulation part of the study to a level of completion and detail that will allow comparison of the alternatives and selection of the recommended plan.

Not all of the alternatives developed in the Alternatives Formulation portion of the study will be carried forth for analysis in this part of the report. Those alternatives that were rated the highest in the Alternatives Formulation web-based survey were included for further study. Also, where appropriate, the highest rated features of several alternatives were combined to form a new alternative. Likewise, features of the alternatives that rated low in the web-based survey were eliminated from further consideration.

The alternatives selected for further study have been evaluated to a consistent level of detail; sufficient to establish technical feasibility, generalized hydraulics, and conceptual level cost estimates. Even at this level, however, specific alignments and locations of flood control features are not known, and will not be developed until conceptual plans are prepared for the recommended alternative.

At the conclusion of this part of the study are several matrices, which illustrate the evaluation process undertaken and forms the basis for selection of the recommended alternative.

## SCREENING OF ALTERNATIVES

The purpose of the screening effort was to select the best combination of features to form three comprehensive alternative plans for the entire study area. The resulting three screened alternatives are comprised of elements chosen from all of the available alternatives as previously described.

Based on conclusions drawn from the web-based survey results, three screened alternatives, shown on Figures 4-45, 4-46 and 4-47 at the end of this section, were selected for more detailed evaluation. Completed descriptions of each of the three alternatives appear in the following sections.

## ALTERNATIVES DEVELOPMENT

The three screened alternatives were further developed to verify engineering feasibility and to establish approximate costs. During the alternatives development phase, refinements were made to the location and alignment of facilities resulting from the more detailed analysis. The future condition HEC-1 model, which serves as the basis for sizing and routing flood hydrographs, was revised to reflect the drainage channels, storm drain pipes, and detention basins identified for each alternative. The channel routing parameters and the sequence of hydrograph routing and combinations were modified to model the effects of each alternative.

The detention basins, channels, and pipes were then sized based on the revised 100-year discharges. Detention basins were sized to maximize flow attenuation with the land area available using both off-line and flow through concepts. The off-line concept uses a perimeter channel to allow low flows to bypass the detention basin. The flow-through concept allows the entire flow to be intercepted by the detention basin. Channels and storm drains were sized using Manning's equation with a hydraulic slope equal to the average ground slope in the reach. If the ground slope was too steep, causing excessive velocities in the channel, a milder slope with drop structures was specified. Culverts were placed at existing road crossings.

The screened alternatives were presented at the third Laveen ADMP Open House held on June 5, 2001. The Open House consisted of a fifteen-minute informational session followed by a number of stations with information on each alternative.

The informational session provided an overview on the alternatives and the ADMP process. At the stations, participants were able to take a close look at each alternative and speak to ADMP personnel about their specific concerns.

Figure 4-1: Laveen ADMP Open House #3 Information Session

Figure 4-2: Laveen ADMP Open House #3 Alternative Station

Figure 4-3: Laveen ADMP Open House #3 Alternative Station

## VISUAL ANALYSIS

Historically, the Laveen Area was a uniquely situated flat sonoran landscape benefiting from flows from the Salt and Gila River floodplains and South Mountain. The topography, in combination with these factors resulted in the deposition of soils and other materials that contributed to making this area suitable for prehistoric and historic agricultural settlement. These settlement types changed the natural landscape character through the addition of irrigation canals and linear vegetation (i.e., row crops) in prehistoric times, and more recently through road building, utilities and development in general.

To understand and document the visual context of the landscape into which the preferred stormwater management plan alternative would be integrated, a visual analysis was conducted for the study area. The analysis evaluated the scenic integrity, visual sensitivity and scenic character of the study area on an approximate one-mile grid, and resulted in the identification of areas with high scenic integrity, which should be considered in the identification of a preferred Area Drainage Master Plan Alternative in the Laveen Area.

In addition to identifying areas of scenic integrity on a one mile grid, the analysis was also conducted along the proposed alignments of the channels and pipes and at the locations of basins proposed in the three Area Drainage Master Plan Alternatives discussed later in this report. The results of this analysis were used in evaluating the benefits and costs of each alternative discussed in later phases of this study.

The Visual Analysis also provided the basis for the identification of elements that form distinct landscape character areas within the Laveen ADMP Study Area. The purpose of identifying these areas is to identify design elements that, if integrated into the design of the preferred alternative, will result in stormwater management improvements that contribute to the visual quality and overall quality of life in the Laveen Area.

Figure 4-4: View of the Laveen Study Area from San Juan Lookout in South Mountain Park (Visual Analysis Point #41).

### *Visual Analysis Methodology*

The Visual Analysis was conducted on one mile grids and at one mile intervals throughout the study area. The U.S. Forest Service Visual Analysis methodology was considered in conjunction with other studies to develop visual analysis criteria appropriate to the Laveen Area. The three elements scored in the analysis were landscape character, scenic integrity and visual sensitivity. A description of each of these elements is below. The combined scoring in this analysis resulted in a ranking, which identified areas with landscapes that should be conserved or could be positively or negatively impacted by proposed stormwater management facilities.

### *Visual Analysis Elements*

*Landscape Character Area* designates an area of land that has common distinguishing man made or cultural features and the scarcity, density, and scale of those features. Features considered in this analysis included landform, rock formation, surface water, vegetation patterns, cultural or man made structures or features and adjacent scenery.

Areas with a strong landscape character include common and distinguishing features (such as the lines in the following photos formed by rows of crops, fences, shade structures, irrigation canals, roads, and field edges), colors (browns and greens) and landform (flat).

Figure 4-5: Strong landscape character

Figure 4-6: Strong landscape character

*Visual Sensitivity* is the degree of harmony among the features of an area with regards to line, color, form, texture, land form, vegetation, architectural features and streetscape compatibility. Opportunities to increase visual integrity represent opportunities to harmonize discordant features. This category is rated from very high to unacceptably low.

*Scenic Integrity* refers to the distinctiveness, visual dominance (scale/ color/ form), or a variety of features within an area. Features of high scenic quality are distinctive or unique and should be protected. The distinctiveness or uniqueness of features include consideration of the mystery, vividness, intactness, coherence, harmony, pattern, balance, form, line, color, and texture of the landscape Improving scenic integrity can be done through restoring the original or historic variety of vegetation or/and natural or manmade features. The extent of human caused deviation in form, line and color and texture that has occurred in the landscape is considered here.

Figure 4-7 demonstrates an area that has a high degree of scenic integrity. The riparian vegetation is dense and is unique and draws the observer in (creating a sense of mystery). There is a high degree of contrast in the colors, heights, and textures of the vegetation. The landscape is intact and undisturbed

Figure 4-7: High scenic integrity

### *Visual Analysis/ Ranking*

Visually, the study area has some of the highest quality areas between the Salt River, South Mountain, Central Avenue and the Gila River Indian Community Boundary. Fifty percent of the top ten ranked analysis stations for visual quality and almost 70% of the top 50% of the stations ranked for visual quality are within the study area. The analysis stations are documented on Figure 4-11, Visual Assessment Working Map.

The top ranked station for overall visual quality is the Dobbins Overlook in South Mountain Park and is outside of the study area. The second ranked station, also within South Mountain Park and within the Study Area, is the San Juan lookout. The next six top ranked stations, half of which are in the study area, are located at high points on the Carver Hills and South Mountain Foothills.

The next group of viewpoints ranked high for overall visual quality are mostly located between South Mountain and Carver Hills. These areas were found to have visual quality because of the dramatic setting between the Carver Hills and South Mountain, or in the case of areas in South Mountain Park, because of their scenic integrity.

Areas ranking in the mid-range for overall scenic quality fall almost entirely within the study area. These areas are mostly in the flat, agricultural areas and along the undeveloped portions of the Salt River. These areas included features such as historic and agricultural structures, canals, and riparian vegetation.

The areas ranked at the bottom third for visual quality include those areas that have industrial uses or are being developed. Most of these areas are located outside the Study Area.

Station 44 located at the southeast corner of the Study Area, ranked within the top ten for overall visual quality due to its high visual sensitivity and scenic integrity.

Figure 4-8: Visual Analysis Station 44

Station 34, looking east towards the Carver Hills, was ranked in the midrange for overall visual quality.

Figure 4-9: Visual Analysis Station 34

Table 8: Visual Analysis Rankings

| Visual Analysis Assessment Rankings | | |
|---|---|---|
| Station # | Total (averages) | Rank |
| 35 | 69.33 | 1 |
| 41 | 67.33 | 2 |
| 39 | 63.83 | 3 |
| 30 | 63.25 | 4 |
| 32 | 59.33 | 5 |
| 44 | 58.33 | 6 |
| 36 | 58.00 | 7 |
| 31 | 56.67 | 8 |
| 23 | 56.00 | 9 |
| 38 | 54.67 | 10 |
| 37 | 54.33 | 11 |
| 21 | 53.63 | 12 |
| 42 | 53.00 | 13 |
| 19 | 52.00 | 14 |
| 40 | 51.67 | 15 |
| 26 | 50.25 | 16 |
| 27 | 49.00 | 17 |
| 10 | 48.50 | 18 |
| 5 | 48.33 | 19 |
| 33 | 48.25 | 20 |
| 29 | 47.33 | 21 |
| 18 | 47.25 | 22 |
| 22 | 47.00 | 23 |
| 9 | 46.00 | 24 |
| 11 | 46.00 | 25 |
| 24 | 46.00 | 26 |
| 34 | 45.17 | 27 |
| 16 | 44.67 | 28 |
| 14 | 44.17 | 29 |
| 20 | 44.00 | 30 |
| 17 | 43.75 | 31 |
| 25 | 43.67 | 32 |
| 15 | 41.00 | 33 |
| 6 | 41.00 | 34 |
| 4 | 40.76 | 35 |
| 28 | 40.75 | 36 |
| 7 | 40.33 | 37 |
| 13 | 40.25 | 38 |
| 12 | 36.33 | 39 |
| 8 | 35.67 | 40 |
| 1 | 32.50 | 41 |
| 3 | 29.67 | 42 |
| 2 | 29.00 | 43 |

Station within Laveen ADMP Study Area

This ranking is attributed to the largely undifferentiated foreground and mid ground accented by the background views of Carver Hills.

While not in the Study Area, visual analysis station 1 was lowest ranked for overall visual quality. The natural landscape is obscured, the fore, middle and background are unremarkable, and the features of the landscape are cluttered and undistinguished.

Figure 4-10: Visual Analysis Station 1

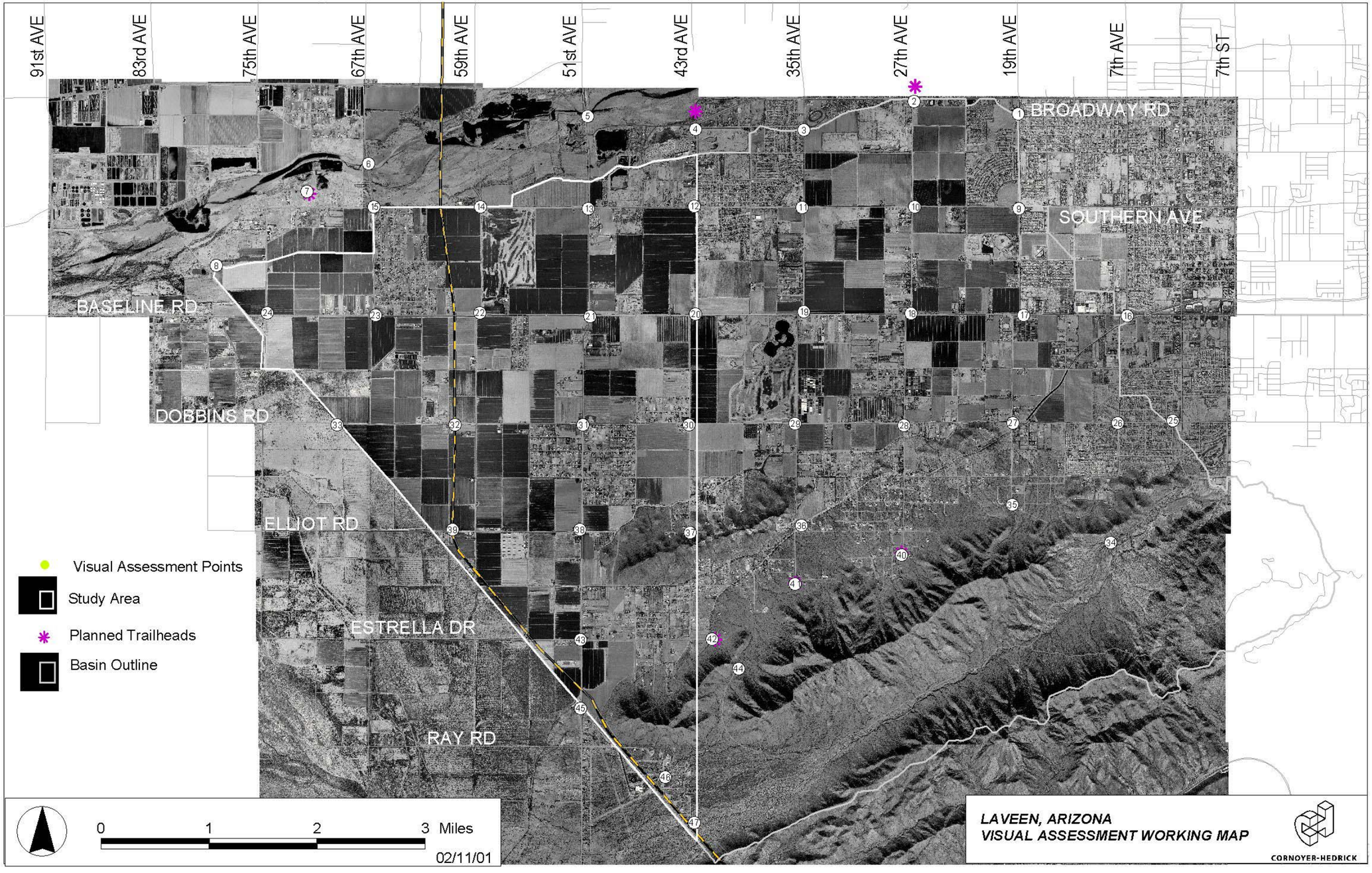



Figure 4-11: Visual Assessment Working Map

***Landscape Character Areas***

In order to ensure that the preferred Area Drainage Master Plan alternative is implemented in a manner that is appropriate to the visual and physical character of the community, a landscape character analysis was conducted. This analysis identified common land and building forms and textures, and landscapes that create specific landscape character areas. The integration of these elements into the implementation of the preferred alternative will substantially contribute to it's harmonious integration into the Laveen Area.

The Laveen Area is typified by four landscape character areas Natural Desert, Agricultural, Transitional and Urban. These areas are identified in Figure 4-21: Laveen ADMP Landscape Cultural Areas. Each of these areas has specific characteristics and is discussed below.

*Natural Desert*

The Natural Desert Landscape Character Area is located on the slopes of South Mountain within the Study Area and the Carver Hills. This landscape character unit is typified by dramatic, sloping topography, low, loose vegetation, a rough texture and a primarily brown color palette.

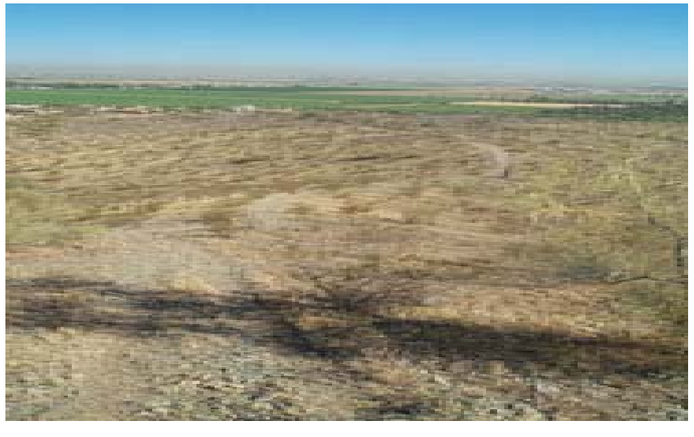


Figure 4-12: Natural Desert Landscape – loose vegetation

Figure 4-13: Natural Desert Landscape – steep slopes, brown color palette, rough texture

*Agricultural*

The Agricultural Landscape Character area is mostly located in the area between the Salt River and South Mountain, excluding the Carver Hills. These areas are mostly interim use farms and feed lots. While this landscape is typical of the recent history of the area, the proximity of Laveen to downtown, Central Phoenix, and South Mountain the planned construction of the southwest loop, and the dramatic mountain views has attracted new residents to the area. Current residents are most concerned about the loss of the agricultural landscapes, lifestyles and character of Laveen, and are working with the City of Phoenix to develop trails, standards and development patterns that will preserve elements of the agricultural landscape and lifestyle for future residents.

Figure 4-14: Agricultural Landscape – crops

The agricultural landscape character areas in Laveen include a variety of development types. Strong geometric lines (which stand in stark contrast to the organic forms of the Natural Desert Landscape Character Area in the background of the previous photograph) take the form of crops, roads, telephone, power, and fence lines, irrigation canals and structures, such as silos or shade structures for cattle.

Figure 4-15: Agricultural Landscape - telephone, power lines

Figure 4-16: Agricultural Landscape – fence lines

Figure 4-17: Agricultural Landscape – irrigation canal, silo

*Urban*

The Urban Landscape Character Areas are those places that include residential subdivisions, large single use buildings (such as high schools) and commercial development.

Figure 4-18: Urban Landscape

Figure 4-19: Urban Landscape

These areas are typified by geometric forms placed at regular interval (such as square and rectangular buildings, triangular roof tops, curved roadways) an organized landscape pattern focused around structures, and a variety of managed vegetation.

Figure 4-20: Urban Landscape Character

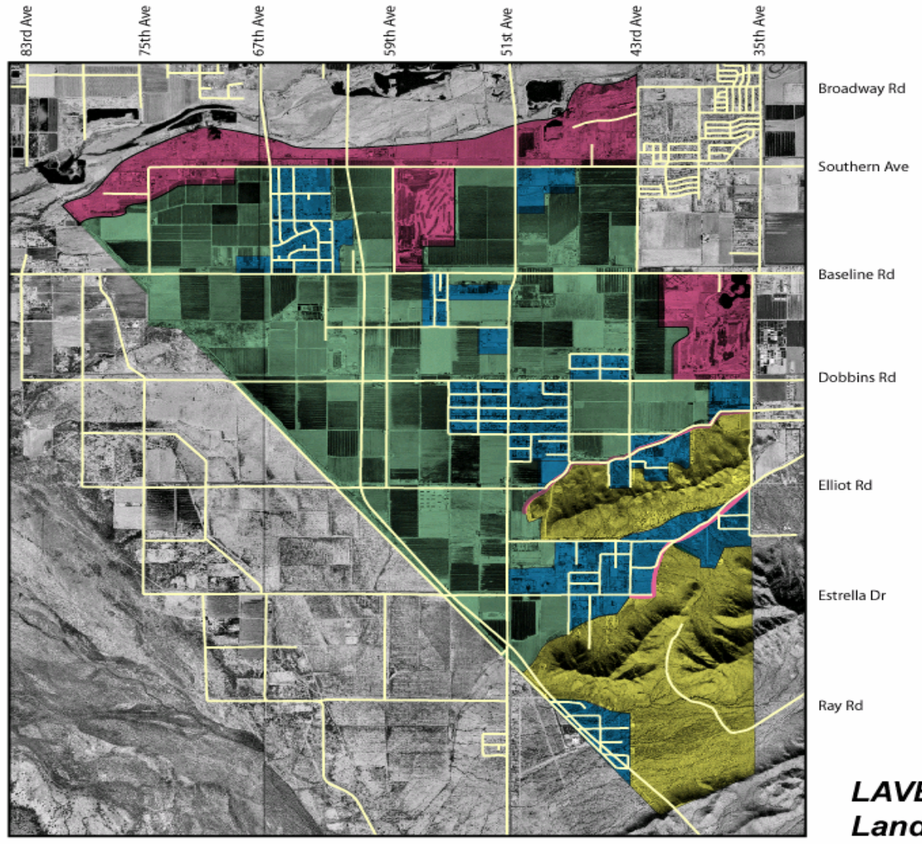



Figure 4-21: Laveen ADMP Landscape Cultural Areas

Urban Landscapes include a variety of geometric forms placed at regular intervals. In Laveen, these areas are located around new development occurring along Baseline Road west of 35th Avenue, and in the valley between Carver Hills and South Mountain.

*Transitional*

The Transitional Landscape Character Areas are those places that include elements of the agricultural, natural desert and urban landscapes.

In the Laveen ADMP study area, these places are either golf courses, which provide many of the elements of the agricultural landscape in an urban landscape format, or along the Salt River where mining and other industrial uses are juxtaposed with natural landscapes.

The colors and linear elements of fences and trees blended with the very regular spacing and sculpted landform create a transitional character for the golf course landscapes.

Figure 4-22: Transitional Landscape

***Landscape character thematic concepts***

Landscape character thematic concepts were developed from the four landscape character areas. The purpose of the thematic concepts is to provide options for visually and culturally integrating the preferred alternative into the Laveen Area.

*Natural Desert Landscape Theme*

This thematic concept is appropriate in the southern portion of the study area at South Mountain Park and in the Carver Hills area. Although residential development and some mining operations are located around the boundary of the park, minimal man-made disturbance has occurred within this theme area and the native sonoran desert plant community is thriving. Additionally, the scale and height of development in these areas have not impacted the views of the mountains from other areas. The vegetation in the Natural Landscape Desert Character Area and Theme is moderately to highly varied. Within this landscape theme, saguaros and ocotillos provide line and form; the chollas, rock outcroppings and yuccas provide texture. Shrubs and trees provide seasonal color and dominate the fore and middle ground. This is the area where natural water flow has not been impacted, and within this character area, natural flows are maintained or restored to the greatest extent possible.

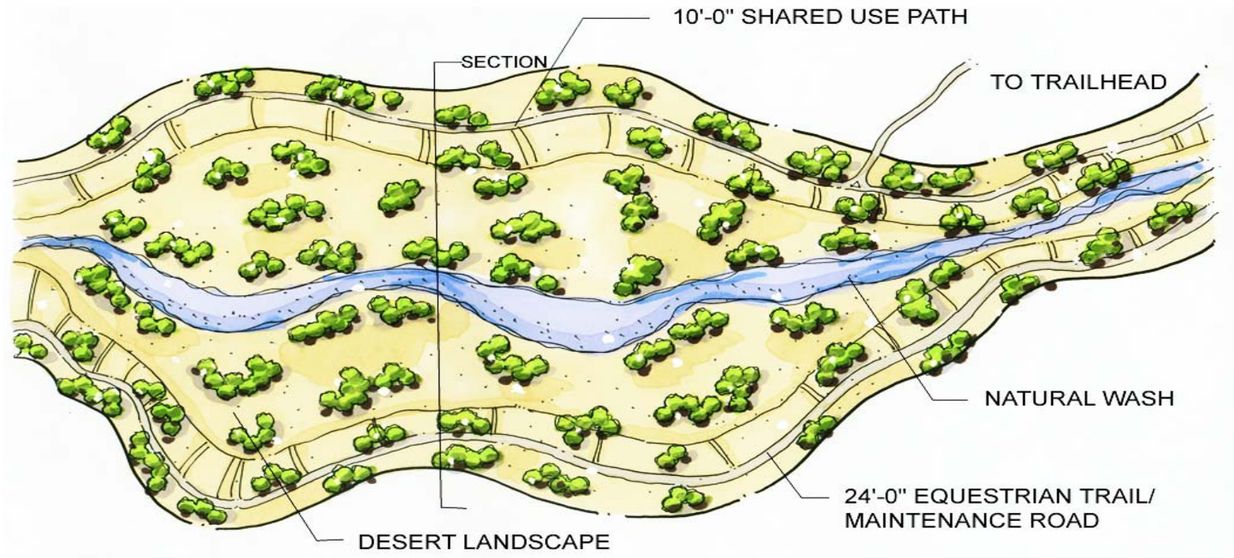



Figure 4-24: Natural Desert Plan for detention basin

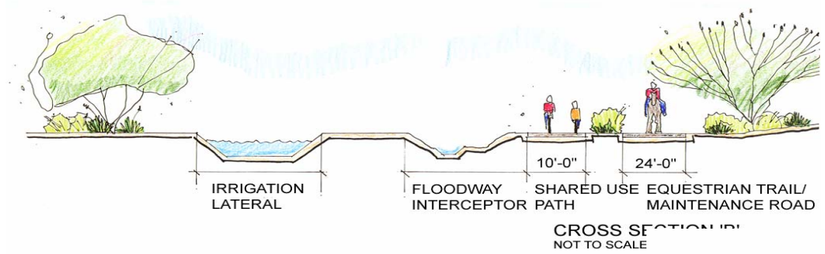



Figure 4-23: Natural Desert Landscape Theme applied to an irrigation lateral (section)

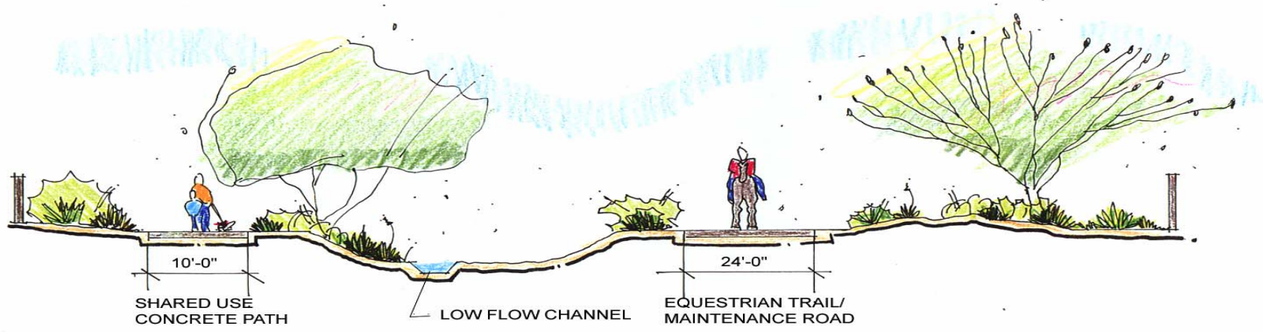



Figure 4-25: Natural Desert Landscape Theme applied to a drainage channel (section)

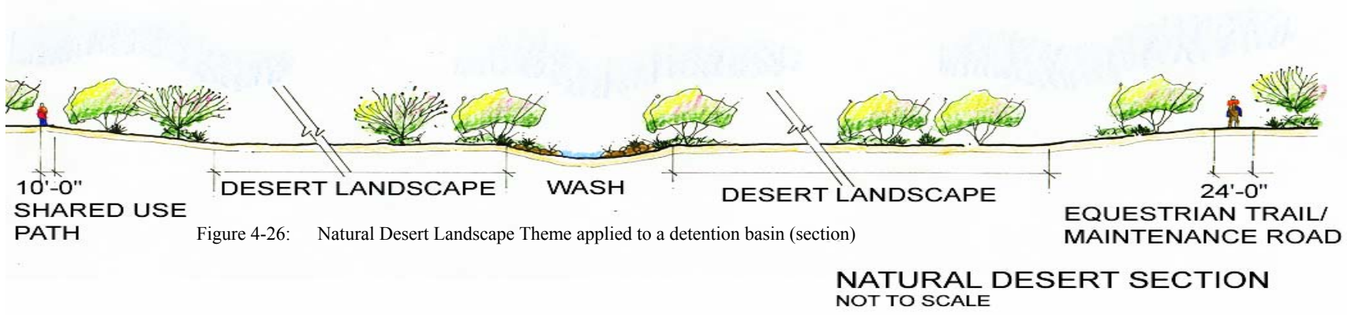



Figure 4-26: Natural Desert Landscape Theme applied to a detention basin (section)

*Agricultural Landscape Theme*

The predominate land use in the Laveen ADMP study area is in active or fallow agriculture. This landscape theme reflects human modification of the natural desert with agricultural fields, scattered farm buildings and grain silos. Formal rows of crops create mono diversity of color, texture and lines in entire sections of land. These patterns change with the planting season. Agricultural fields are square or rectangular in form, and they have been graded almost level to accommodate irrigation applications. Arterial streets and irrigation canals also methodically enforce this grid and maintain the minimal slopes in these areas. Several high voltage overhead power line corridors traverse the study area and they dramatically interrupt the skyline in an otherwise horizontal landscape. Vertical lines and forms are found at farm buildings with coarse textured, windbreaks, green shade trees, palms and scattered outbuildings and barns. The 360-degree panoramic views are maintained in these areas because of the scale and height of this development. Natural water flow in this area has been replaced by canals and ditches, which have a very rigid and geometric form and create distinct lines in the landscape. With all geometric elements the eye looks up or down the canals, streets and overhead power lines toward the axis or vanishing point, the mountains. The agricultural landscape character theme re-creates this character through the use of linear patterns and shapes, flat landforms, and consistent vegetation types.

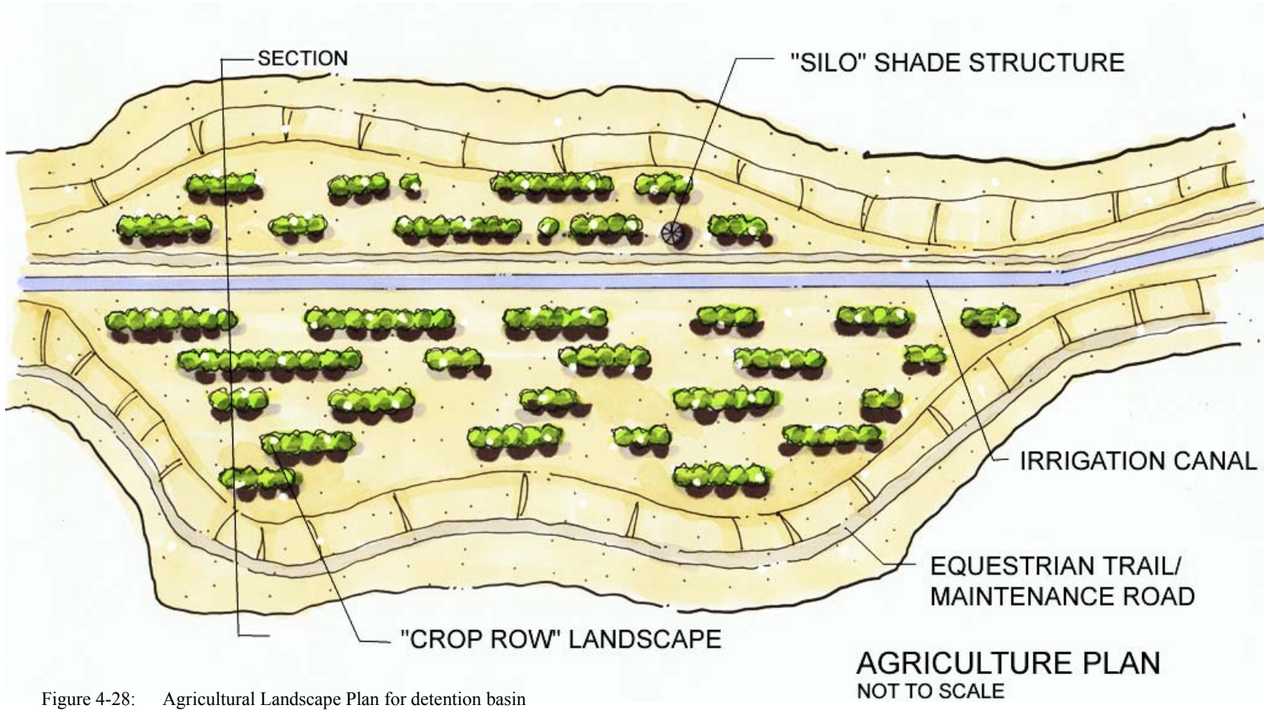



Figure 4-28: Agricultural Landscape Plan for detention basin

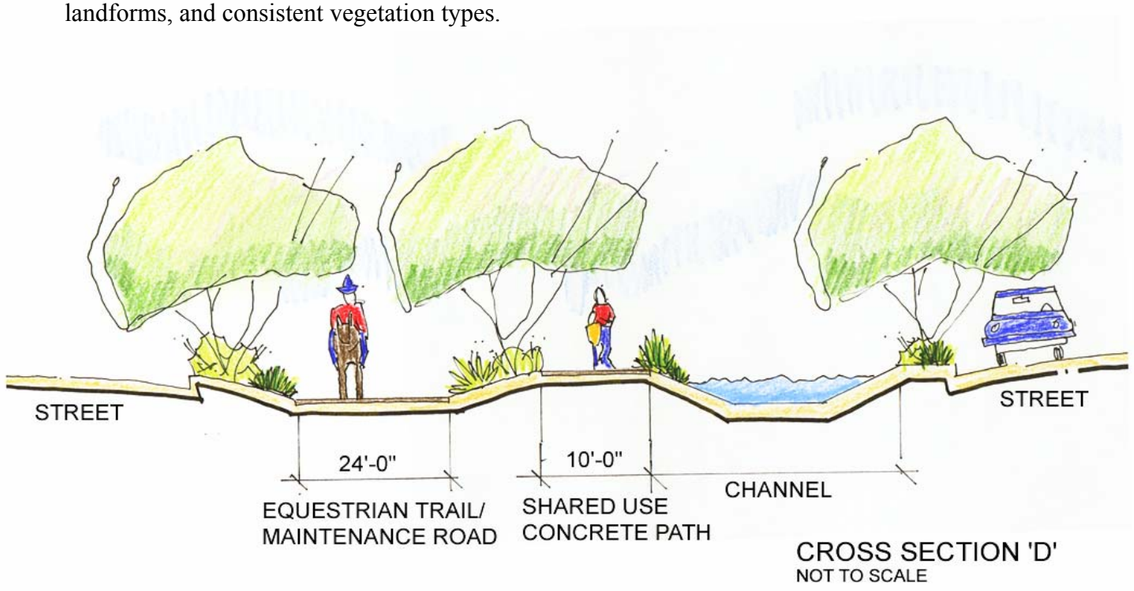



Figure 4-27: Agricultural Landscape trail adjacent to a drainage channel (section)

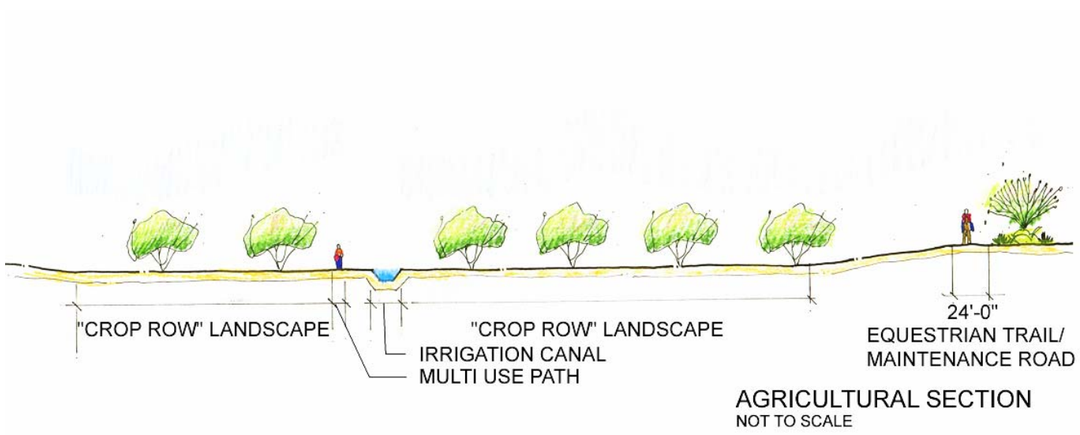



Figure 4-29: Agricultural Landscape applied to detention basin (section)

*Urban Landscape Theme*
Elements that are included within this Landscape Character Area are residential, commercial and industrial applications. The one-mile grid of the street system, irrigation canals and subdivision walls dictate land development patterns and therefore creates dominant line and form within the landscape.

Also affecting line and form in this area are several high voltage overhead power line corridors traversing the study area. Vertical lines and forms are found at the edges of development and at the high voltage power line corridors. The 360-degree panoramic views are maintained in these areas because of the scale and height of this encroaching development.

Most utilities and canals have been placed underground reducing the amount of geometric elements that affect vanishing points and the rigid formality that is associated with them. The parks and golf courses have green, fine textured open play tees and fairways, fine to medium textured shade, desert accent trees in informal to formal planting schemes, and medium to rough texture at the perimeters and in the rough.

The landscape character and the visual perception in the urban area are the most varied of all of the landscape theme areas. The scenic integrity including variety, unity, vividness, mystery, intactness, coherence, harmony, uniqueness, pattern, balance, form, line color and texture is the greatest in the urban landscape area. The urban landscape themes include formal plantings, managed circulation systems and strong geometric forms. Color and texture are carefully managed to be appealing in high use areas. A variety of plant materials is included in this theme.


Figure 4-30: Urban Landscape plan for detention basin

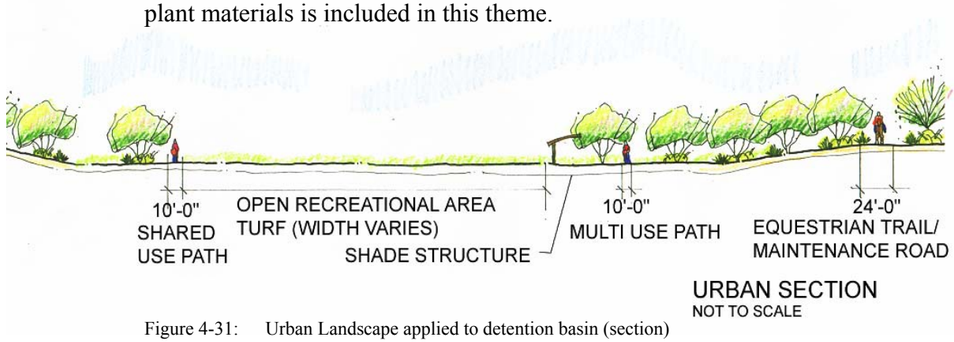



Figure 4-31: Urban Landscape applied to detention basin (section)

*Transitional Landscape Theme*

The transitional landscapes in Laveen occur along the river and in areas that include a mix of character elements, such as golf courses. In the implementation of the preferred alternative, the transitional theme is recommended for the edges of each landscape character area as well as in parks, golf courses, schools, along the banks of the Salt River and public facilities. Many of these areas are framed by development and associated perimeter walls and overhead power lines . This landscape theme includes a mixture of all of the lines, forms, colors; textures associated with the natural desert, agricultural and urban landscape character areas and functions as a connection to 'glue' together landscapes of different characters.

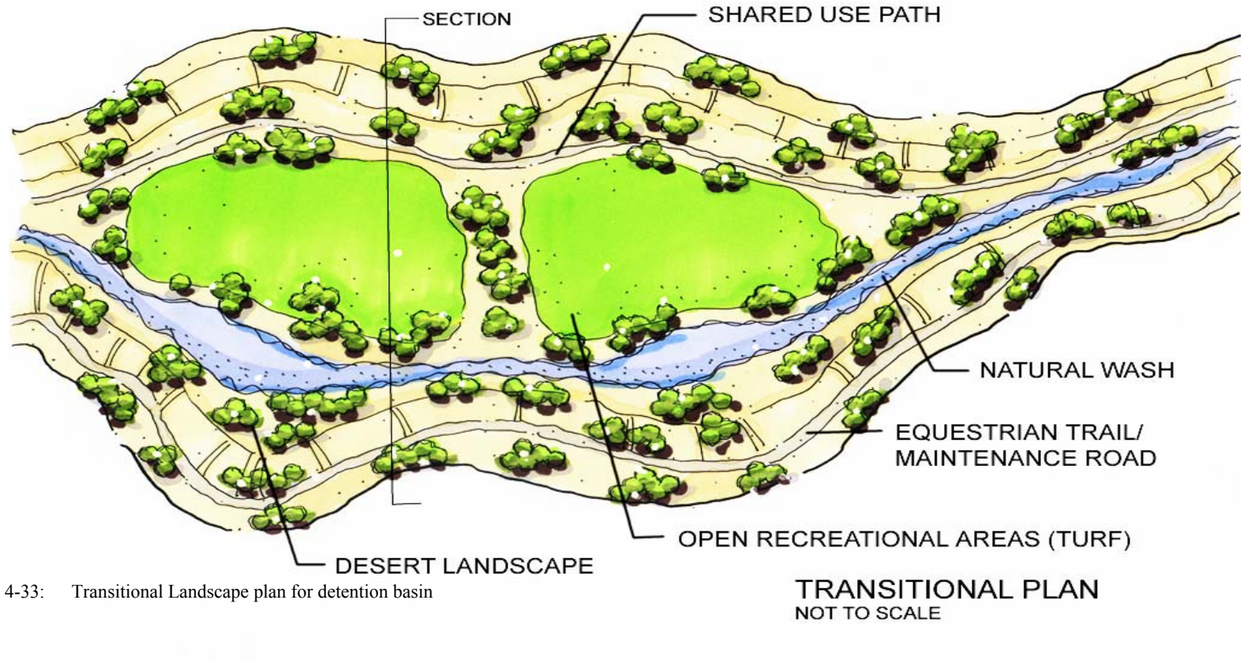



Figure 4-33: Transitional Landscape plan for detention basin

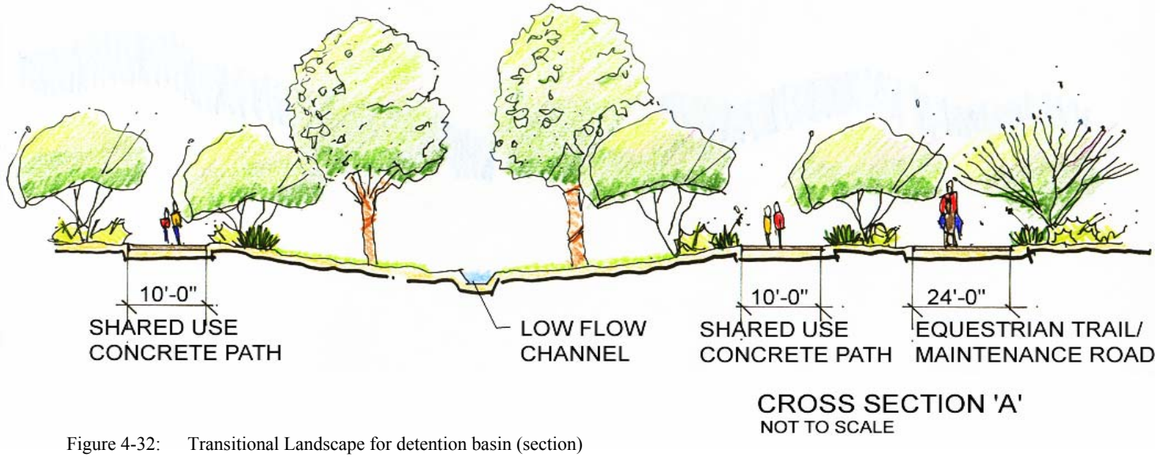



Figure 4-32: Transitional Landscape for detention basin (section)

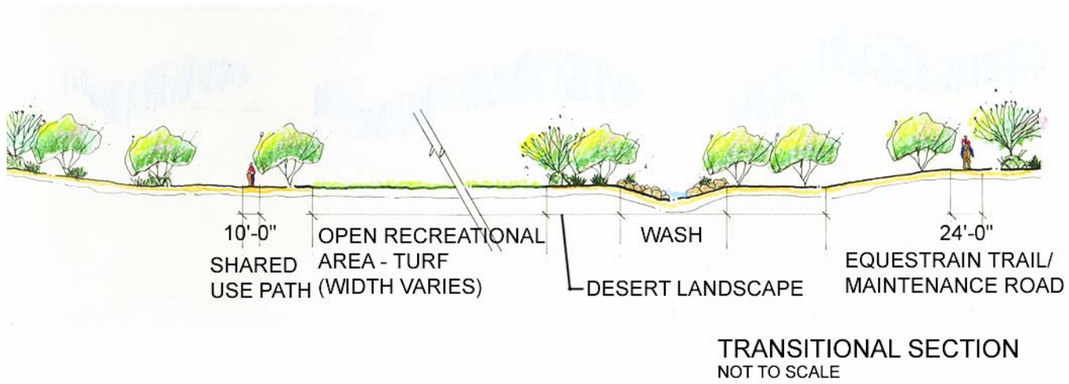



Figure 4-34: Transitional Landscape for detention basin (section)

## BENEFITED AREA ANALYSIS

All of the alternatives developed in this section of the ADMP will provide flood protection to homes, commercial buildings, and agriculture, which are currently susceptible to inundation and inconvenience. Based on existing and future zoning information, the areas prone to this type of flooding amount to approximately 4100 acres. Figure 4-35 illustrates the areas that are most commonly flooded during a major storm event and that will be protected under each alternative.

### *Land Classification*

The flood prone areas were classified based on land use categories. Using GIS tools, the acreage within each category was estimated. Tables 9 and 10 list this information for existing and future land uses.

Table 9: Acreage by land use category for Existing Zoning

| Land Use Category | Acres |
|---|---|
| 1-2/acre Res | 621 |
| 2-5/acre Res | 18 |
| Agriculture | 3055 |
| Industrial | 319 |
| Neighborhood Retail Center | 1 |
| TOTAL | 4014 |

Table 10: Acreage by land use category for Future Zoning

| Zone Type | Acres |
|---|---|
| 0-1 units/acre | 1268 |
| 0-2 units/acre | 873 |
| 2-5 units/acre | 1132 |
| 5-10 units/acre | 192 |
| 10-15 units/acre | 31 |
| Commerical | 255 |
| Commerical/Business Park | 433 |
| TOTAL | 4184 |

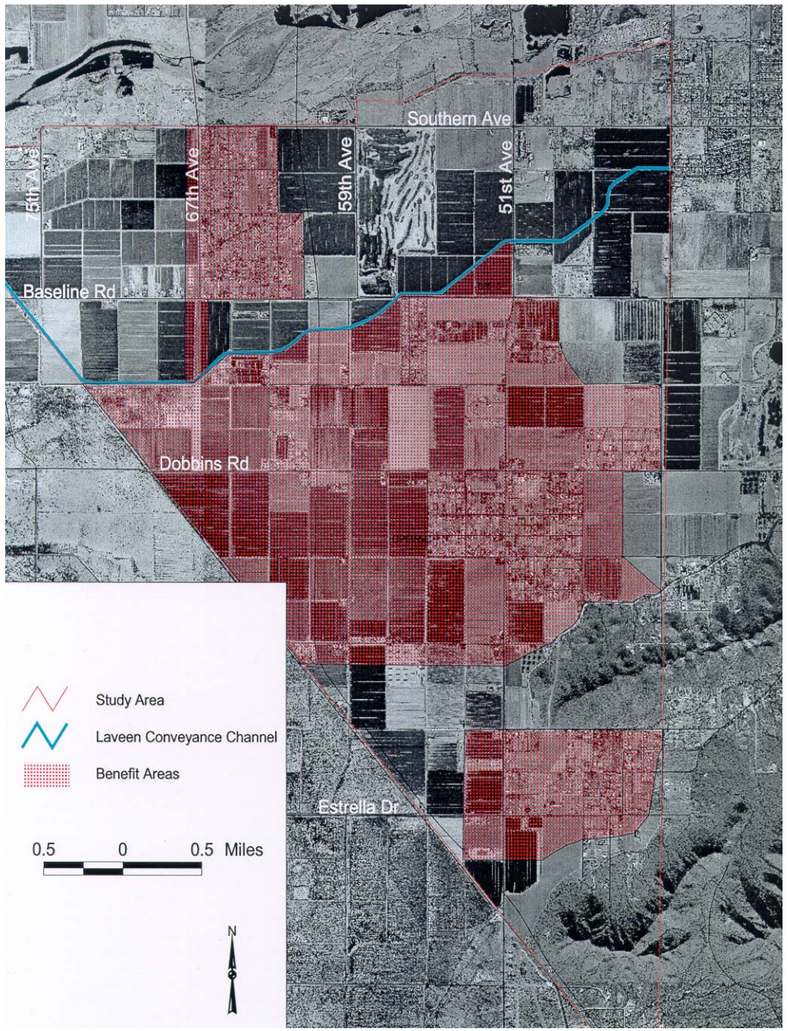



Figure 4-35: Areas Prone to flooding

### *Property Valuation*

Average dollar values for the structures within the different categories were obtained from various sources. For residential structures, the value was assessed using existing realty data and information obtained from the Maricopa County Assessor's Office. The following table summarizes the average value for residential structures within each zoning category. A considerable range exists for structure values within each category and the average value may not be representative of any particular structure.

Table 11: Average property value for residential zoning type

| Zone type | Average value per duelling unit ($1000s) |
|---|---|
| 0 – 1 due/acre | $315.75 |
| 0 – 2 due/acre | $250 |
| 1 – 2 due/acre | $285 |
| 2 – 5 due/acre | $154 |
| 5 – 10 due/acre | $100 |
| 10 – 15 due/acre | $50 |

The value of commercial structures, as well as agricultural land, was adapted from existing studies for the area of Tres Rios, AZ located just northwest of the Laveen ADMP study area. For agricultural land use, it was assumed that all crops were based on crop prices for cotton, for 1998 (Tres Rios Feasibility Report. USACE, April, 2001).

### *Depth to Damage Curves*

According to USACE Economic Guidance Memorandum 01-03, *Generic Depth-Damage Relationships*, the methodology for estimating flood damages is a standardized process. The process involves the use of generic depth/damage relationships developed by the Federal Emergency Management Agency (FEMA) in conjunction with a real estate survey of all the structures within the area including their contents, and frequency/discharge and frequency/depth hydrologic models. The generic depth/damage functions provide an estimate of the losses due to depth of flooding above the first floor elevation of a given structure.

Table 12 represents an excerpt of the depth/damage function according to the Flood Insurance Rate Reviews for 1997 of the National Flood Insurance Program's Actuarial Information System.

Table 12: Depth/damage function for residential structures

| Level of flooding above first floor (ft) | Damage percent to residential structure not including mobile homes |
|---|---|
| -0.5 | 8% |
| 0.0 | 16% |
| 0.5 | 16% |
| 1.0 | 16% |
| 1.5 | 21% |
| 2.0 | 25% |
| 2.5 | 26% |
| 3.0 | 28% |
| 3.5 | 29% |
| 4.0 | 30% |
| 4.5 | 30% |
| 5.0 | 31% |

For example, in an event where a residential structure is flooded to 1 foot above the first floor, there will be an estimated damage of 16% of the value of the structure. This does not include the content value which will obviously add to the amount of losses. Other functions exists where these losses are accounted for (furniture, carpet, etc). For this study, this value was not incorporated since a valid estimation would require more detailed survey information. From the previous table, it can be observed that the damage due to 3 inches, 6 inches, and 9 inches of flooding above the 1st floor of a home results in the same average loss or damage to a structure.

This information was used to estimate the extent of damage for the Laveen area due to flooding at various depth levels. Figures 4-36 and 4-37 illustrate the losses due to flooding for existing and future zoning types.

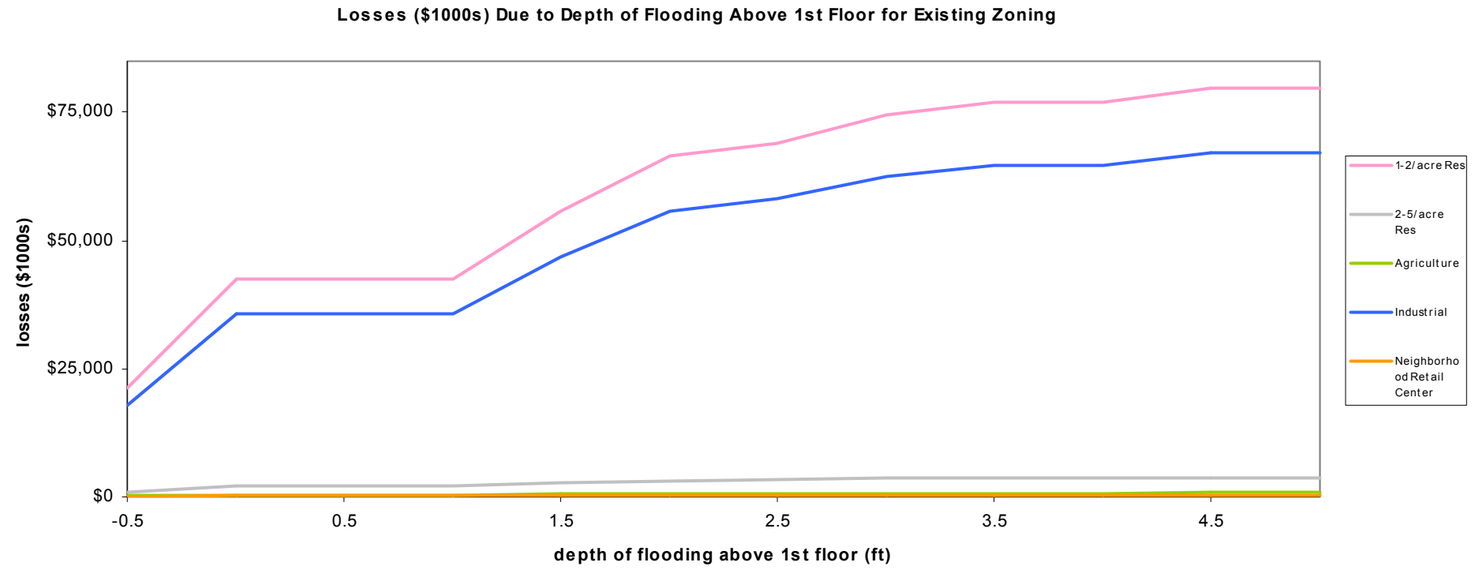



Figure 4-36: Losses to structures due to flooding above 1st floor for Existing Zoning

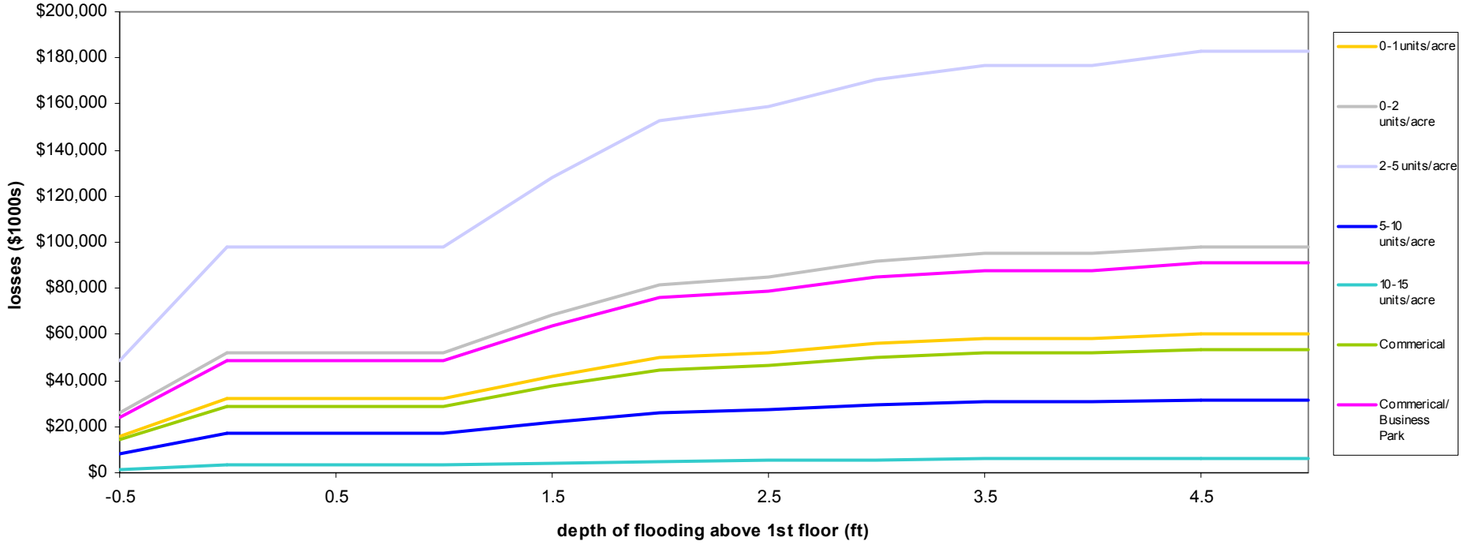



Figure 4-37: Losses to structures due to flooding above 1st floor for Future Zoning

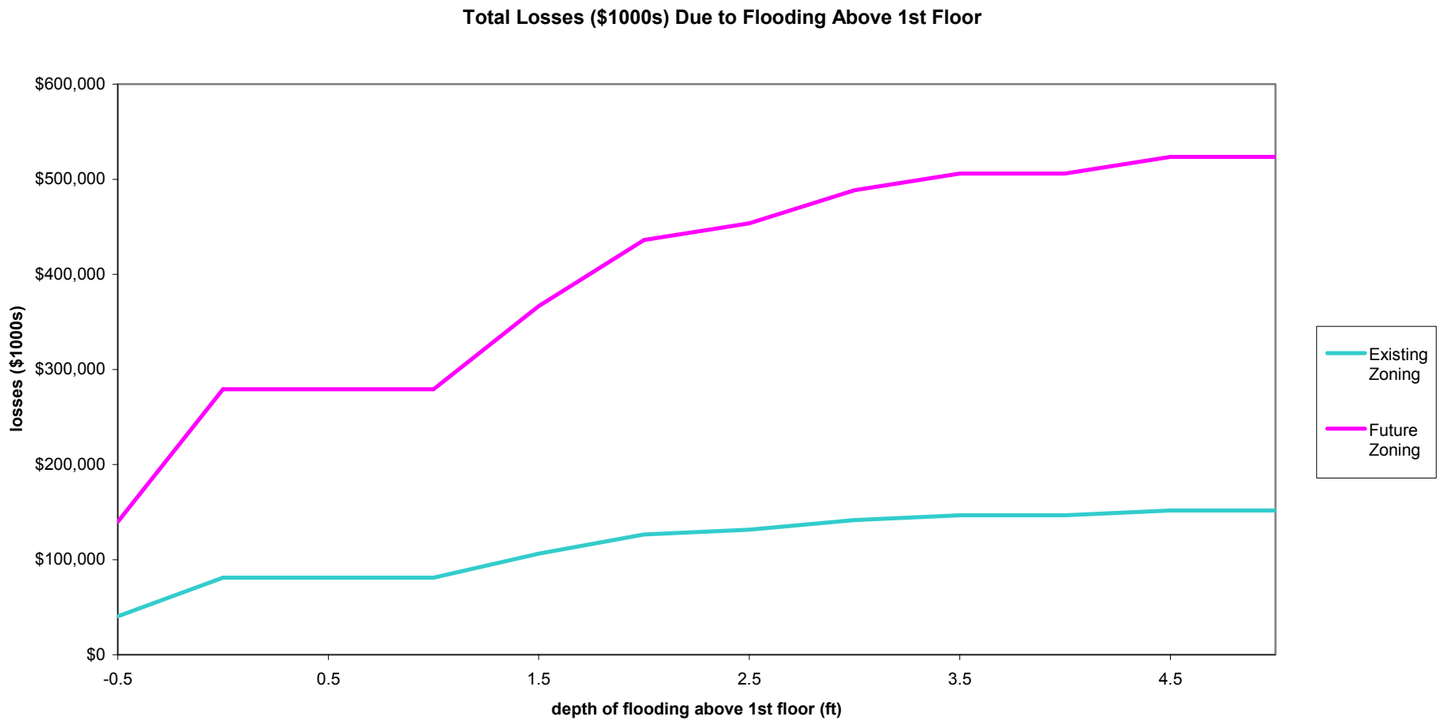



Figure 4-38: Total losses to structures due to flooding above 1st floor

As future zoning plans develop within the Laveen area, more residential and commercial structures will be present. The total property value in Laveen will increase as will the losses due to flooding. For an event that results in 3 to 12 inches of flooding above the first floor of residential structures in the area, an approximate increase in losses of about $198,000,000 can be estimated when comparing existing land use and future land use (from $80,884,000 worth in losses in the existing land use plan to $279,184,000 in the future land use). These losses may be prevented with the flood control alternatives in place.

In addition, it can be observed that even when the depth of flood resulting from a major storm event is not above the 1st floor elevation, structural damages are evident and quantifiable. This fact is critical for the Laveen area since documentation of flooding above the floor level of structures may not be readily available.

### *Hydrologic Models*

The HEC-1 hydrologic models in Appendices D, E, and F were used to predict the depths of flow that may be observed at various concentration point locations within the Laveen ADMP study area under existing conditions, future conditions, and for each of the three alternatives.

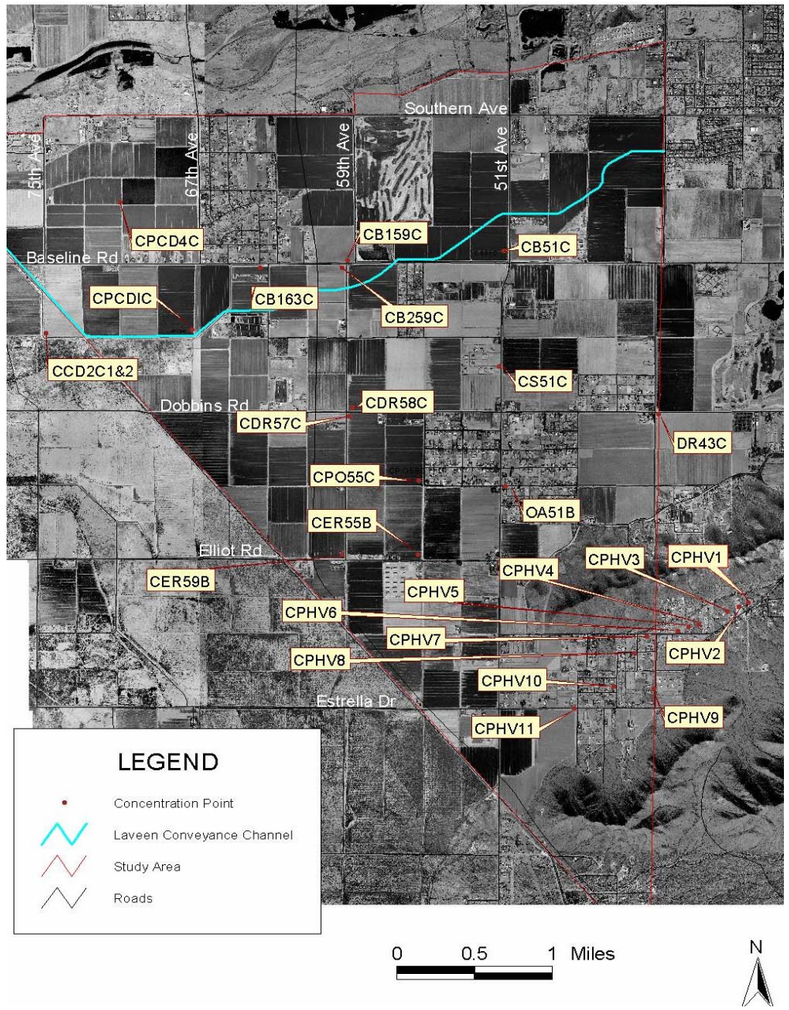



Figure 4-39: Location of concentration points

It is important to note that a complete hydraulic model for each of the above noted conditions would be required to accurately predict depths of flow, and therefore depths of flooding. The hydrologic models simply report stormwater runoff rates and volumes. The rate and volume information was summated at the locations indicated on Figure 4-39, and depths of flow estimated as shown in Figure 4-40.

It is not possible, by this method, to predict depth of flooding at any specific dwelling unit or parcel of land within the study area. Only at the major concentration points, where conveyance of the storm flows within a defined path can be demonstrated, has a flow depth been predicted. These predictions are shown for purposes of comparing alternatives and cannot be used for actual flood damage assessment work. For the center portion of the study area, towards the Laveen town core, a reduction of approximately half of the expected flows is also observed. This area includes the Laveen Elementary School, which has historically been an area of concern. For this portion of the study area, the greatest reduction in expected flows and corresponding volume is observed.

The only point within this portion where a reduction of flow for all alternatives is not consistent, is at 51st Avenue and Olney (south of Dobbins Road). At this point, Alternatives 2A and 4 greatly reduce the flow and volume, whereas Alternative 6 shows a reduction to about half of the original flow but is still much greater than the flows expected with the any of the other alternatives in place.

For Hidden Valley Watershed, a similar reduction of flows is observed with all three alternatives in place. The areas in the southern portion of the watershed will benefit from a reduction of expected flows to approximately half of the flows that would be observed in both existing and future conditions.

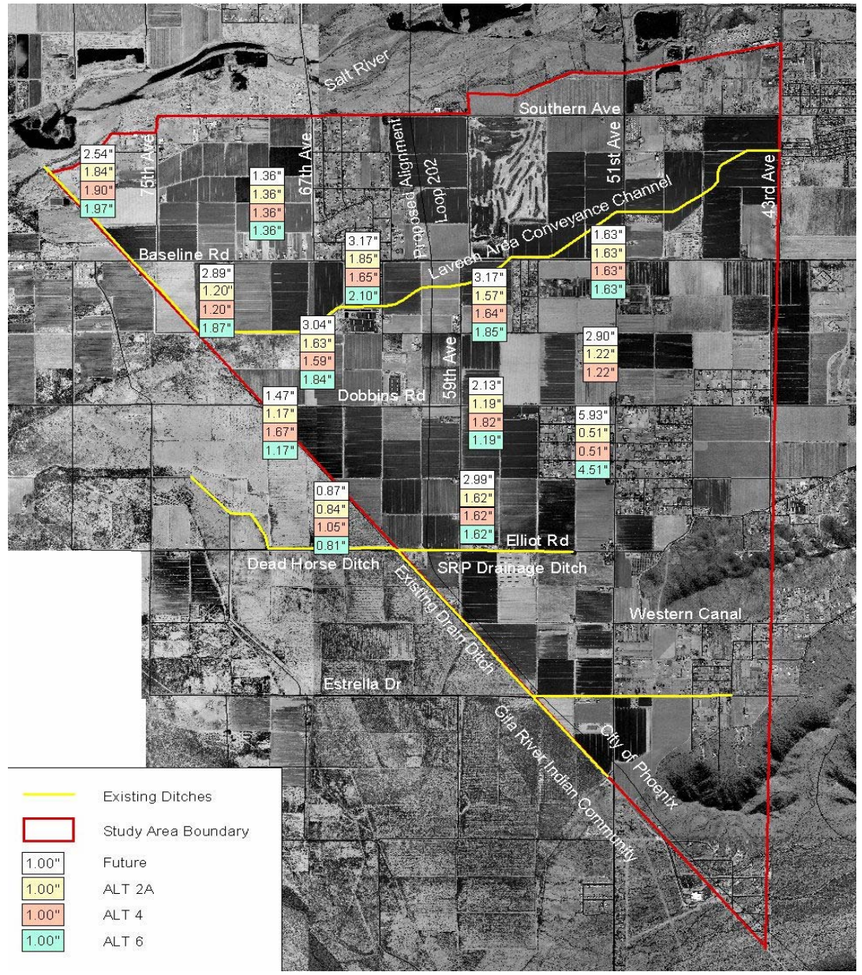



Figure 4-40: Depth of flooding at concentration points

## DESCRIPTION OF ALTERNATIVES

The alternatives chosen for further evaluation are described in this section. The cost for each alternative is summarized at the end of the section in Tables 13 through 15. The total cost includes a 30% contingency on the construction cost which will account for engineering design, construction administration, environmental issues such as 404 permits, cultural resources surveys and hazardous waste surveys, and other minor detail items. Figures 4-45, 4-47, and 4-49 show the plan elements, descriptors, and the detailed cost estimate breakdowns for each alternative.

Each alternative assumes that the Laveen Area Conveyance Channel has been constructed and will be treated as an "existing condition". This is both for the engineering purposes of intercepting and conveying flood flows, as well as for the visual analysis purposes of integrating with the existing landscape and character of the region

### *Alternative 2A*

*Estimated Cost*
The estimate cost of Alternative 2A is $31,157,257. Additional costs may be incurred with the incorporation of multi-use infrastructure, which would be funded by organizations other than the District. Refer to Table 13 for a detailed explanation of the estimated costs.

Alternative 2A includes a detention basin, pump station, and storm drain that provide flood protection for the Gila River Indian Reservation. The other alternatives do not provide protection for the GRIC. Without these elements, the cost of Alternative 2A is $21,121,361.

*Description*
Alternative 2A is similar to Alternative 2 as presented earlier in this study, however it has been modified to incorporate some of the more effective features of Alternatives 1 and 3. Alternatives 1, 2, and 3 all received similar scores on the web-based survey and the most desirable features were easily incorporated into one combined alternative.

Conveyance of the 100-year flood flows in Alternative 2A is mainly achieved above ground in open, multi-use drainage channels. The channels will be relatively wide, with gentle side slopes, and vary in landform and theme throughout their lengths. Sizes of the multi-use drainage channels will be somewhat reduced by the placement of detention basins at strategic locations within the drainage channel system. Detention basins will serve to attenuate peak flows, thereby limiting the required conveyance capacity needed in each channel. The detention basins will also serve as important nodes in the multi-use system. They may be used as trailheads, equestrian centers, ballparks, soccer fields, etc.

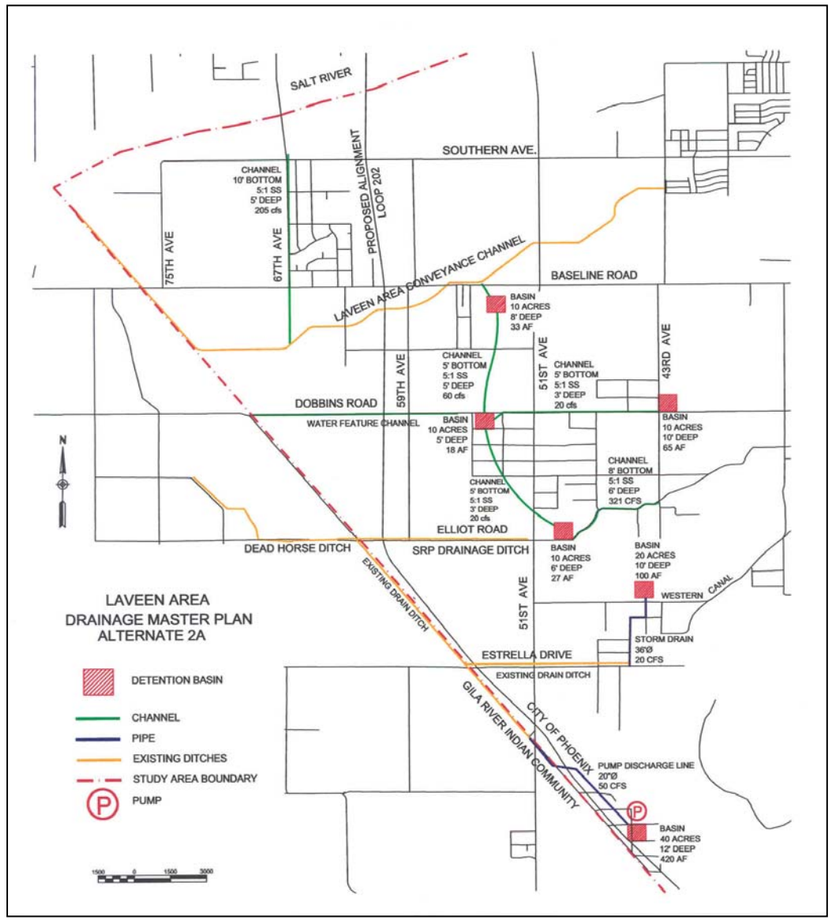



Figure 4-41: Alternative 2A, "Break the Grid"

Some of the main elements of Alternative 2A are:

- Including as much as possible the recommendations found in the Laveen Watercourse Master Plan. A meandering channel provides for north/south conveyance of storm flows generally along 51st Avenue. Also, a waterway feature through the town core may be provided. The water feature would serve no purpose for flood control, but would provide for connectivity of a trail system and other multi-use elements through the planned town core.
- An open, multi-use channel along Dobbins Road flows west from a detention basin at 43rd Avenue, and ultimately drains to a detention basin near 51st Avenue.
- Multi-use flood channels for the Western Canal and Telegraph Pass to control stormwater and convey it westerly. Right-of-way for the channels will allow for equestrian and other users
- A detention basin to be located at 51st Avenue and Dobbins will be incorporated into the town core and water feature system.
- A detention basin will be located on the Cheatum property at 47th Avenue and Elliot.
- A trail system along GRIC boundary, connecting the Salt River to several other trails, notably the Laveen Area Conveyance Channel, the Dobbins Road Promenade, and the Western Canal. The trail system will allow for trailheads in South Mountain Park and can be extended along the Salt River to other trailheads and destinations. The connectivity provided by this trail system will facilitate the passage of wildlife and create wildlife corridors.
- Drainage that collects at 67th Avenue will be conveyed north towards the Salt River and south towards the Laveen Area Conveyance Channel in a multi-use channel system.
- A pump station and force main will be located at a detention basin at South Mountain Park and the GRIC boundary to force water northwesterly along the GRIC border, outfalling to Dead Horse Ditch.

*Engineering Considerations*
A detention basin is proposed at the intersection of 43rd Avenue and Dobbins Road. The basin has a top area of 10 acres, a bottom area of 3.1 acres, and is 10 feet deep with 5:1 side slopes. This basin will have a metered outflow, not exceeding 20 cfs, to a channel along Dobbins Road. The channel from 43rd Avenue to west of 51st Avenue will have a bottom width of 5 feet, side slopes of 5:1, and flow 3 feet deep. The channel will discharge to a detention basin west of 51st Avenue and Dobbins Road.

The detention basin west of 51st Avenue and Dobbins Road has a top area of 10 acres and a 4-acre bottom area. It is 5 feet deep with 5:1 side slopes.

Another detention basin is located at the intersection of Elliot Road and 47th Avenue. A channel along the SRP lateral is used as a collector facility and outlets to this detention basin. The basin has a 10-acre top area and a 3.8-acre bottom area. It is 6 feet deep with 5:1 side slopes. The channel that feeds into the basin has an 8 feet wide bottom and 5:1 side slopes. It will have the capacity to carry 320 cfs and flows at a depth of 6 feet.

The detention basin at 47th Avenue and Elliot Road will outfall to the detention basin west of 51st Avenue and Dobbins by way of a drainage channel. This channel will have a bottom width of 5 feet, flowing 3 feet deep, and have side slopes of 5:1. The flow rate in the channel will not exceed 20 cfs.

Flows outfalling the detention basin at 51st Avenue and Dobbins will be conveyed north to detention basin just west of 51st Avenue and Baseline Road. The drainage channel connecting the two detention basins will have a bottom width of 5 feet and flow 5 feet deep. The channel will have 5:1 side slopes and have a capacity of 60 cfs.

The detention basin west of 51st Avenue and Baseline Road will have a top size of 10 acres and a 3.4-acre bottom. It will be 8 feet deep with 5:1 side slopes. This detention basin will be located in close proximity to the Laveen Area Conveyance Channel and will ultimately outfall to that facility.

Flows that currently collect and inundate 67th Avenue will be directed to a drainage channel that will flow south, parallel to 67th Avenue, from Southern Avenue to the Laveen Area Conveyance Channel. The 67th Avenue Channel will have a bottom width of 10 feet and side slopes of 5:1. The channel will flow at a depth of 5 feet and have a capacity of 205 cfs.

A 20-acre detention basin will be located on the north side of Carver Road, at a wash just west of the Western Canal, to collect flows at that point. The basin will have a volume of 100 acre-feet and be approximately 10 feet deep. The basin will outlet south to 47th Avenue and Estrella Drive in a storm drain 36 inches in diameter at a flow rate of 20 cfs. The storm drain outfalls to an existing SRP drainage ditch that heads directly west along Estrella Drive.

This alternative will collect the flows that come off the backside of South Mountain in a 40-acre detention basin. This will prevent existing flows from crossing the reservation boundary and eliminate the frequent flooding problems experienced at the Vee Quiva Casino and at residential areas along 51St Avenue (also known as Beltline Drive on the Reservation) in the town of St. Johns. The basin will be sized to hold a volume of 420 acre-feet. The basin will be evacuated through a storm drain pump station and force main system. Discharge rate of the pump station will be 50 cfs (22,500 gpm). The force main will be 20 inches in diameter and approximately 1 mile long. The force main will discharge to the existing drainage ditch running diagonal, parallel to the GRIC boundary (Dead Horse Ditch).

*Environmental Considerations*

A diverse range of cultural resources, from prehistoric villages and canals to historic buildings and roads, are located within the Laveen ADMP study area. As previously described in Part 2, only about 23% of the ADMP area has been evaluated in recent, intense cultural resource survey. Therefore, all of the alternatives have the potential to impact cultural resources, especially in agricultural fields and under roads where subsurface disturbances have been limited to only a few feet. As with each of the alternatives, additional archeological surveys of the area will be expected.

Because of the mostly agricultural nature of activity in the area, there is a relatively small concentration of potential hazardous material sites throughout any of the alternatives. Underground storage tanks are located at several of the major intersections throughout the downtown Laveen area. Only one leaking underground storage tank is located in an area that may conflict with the project at 51st Avenue and Dobbins Road. This site is likely to affect all three alternatives equally.

Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*, directs that programs, policies, and activities not have a disproportionately high and adverse human health and environmental effect on minority and low- income populations. The population in Laveen is comprised of low-income and minority persons. The goal of this project is to improve flood conditions for businesses and residences in the Laveen area. The alternative has the potential to displace residents depending on the final location of the drainage basins and path of the proposed channels. Locations of the basins and channels were determined by creating the best solution based on current, past, and future flooding problems. Therefore, the project is not anticipated to have a disproportionately high or adverse impact on low-income or minority populations. This project is expected to benefit Laveen residents by providing increased flood protection to the area and increasing recreational opportunities by providing multi-use paths.

Alternative 2A provides by far the features that most favorably meet the environmental goals established by the stakeholders group for wildlife habitat improvement. Because the alternative is based on open channels within linear rights-of-way, opportunities are created for wildlife passage and for habitat enhancement. The channels will serve as corridors for wildlife to have access from the Salt River to South Mountain Park, unimpeded by urban development.

*Multi-use Opportunities*

This alternative offers a variety of trails and detention basins which contribute to the implementation of the planned Laveen Watercourse and Baseline/Dobbins Scenic Drive, support planned trailheads, provide an amenity for the planned Laveen Core and create connections between the Salt River and South Mountain Park.

The Baseline/Dobbins Scenic Drive is supported with a channel proposed along Dobbins Road from 43rd Avenue to the Gila River Indian Community Boundary. Basins at 43rd and 51st Avenue that are associated with this channel will also provide opportunities for open space and recreational areas along Dobbins Road and in the Laveen Town Core. A meandering channel between Elliot Road and the proposed Laveen Area Conveyance Channel contributes to the implementation of the Laveen Watercourse plan. This channel is also associated with basins at Elliot and Baseline Roads. The basins can also provide open space and recreation opportunities at these locations. Channels proposed along Estrella Drive and 67th Avenue support planned trails and are also compatible with the planned Laveen Watercourse. A channel between Estrella Drive and Dead Horse Ditch along the Gila River Indian Community border, integrated into a trail between the South Mountain and Salt River, will provide connections between these two amenities.

*Planned Landscape Character Scheme*

The landscape character theme for this alternative provides opportunities to integrate open channels and detention basins into the community through landscaping and design. Generally, the drainage channels would be open, and designed to accommodate shared use trails and equestrians; detention basins would be designed with passive open spaces in the southern portion of the study area and more active turf areas towards the north.

*Advantages*

- Provides connections between the Laveen Area Conveyance Channel and the Salt River.
- Provides the most recreational opportunities
- Provides most wildlife corridors (Salt River to South Mountain Park)
- Incorporates the Laveen Watercourse Plan
- Addresses GRIC flooding issues
- Provides connections between important recreational resources.
- Contributes to the Implementation of the Baseline/Dobbins Scenic Drive, Laveen Watercourse, and Laveen Town Core
- Provides additional opportunities for parks.
- Implements trails identified in the Phoenix General Plan.

*Disadvantages*

- Very right-of-way intensive
- High maintenance associated with open areas
- Operating costs associated with pump station
- The best locations for basins may not be coincident with the best locations for parks.

*Constraints*

- Partnering agreements needed with city of Phoenix and others for multi-use opportunities

- May have local opposition to routing the channel along 51st Avenue from Elliot Road to Dobbins Road because of conflicts with existing housing.

***Alternative 4***

*Estimated Cost*

Alternative 4 estimated cost = $23,756,204. Additional costs may be incurred with the incorporation of multi-use infrastructure, which would be funded by organizations other than the District. Refer to Table 14 for a detailed explanation of the estimated costs.

*Description*

Alternative 4 is the "Storm Drain" alternative. While extensive use of storm drains are used to solve flooding problems, many multi-use opportunities are still provided for along an extensive drainage channel and detention basin system. Notable features of this alternative include:

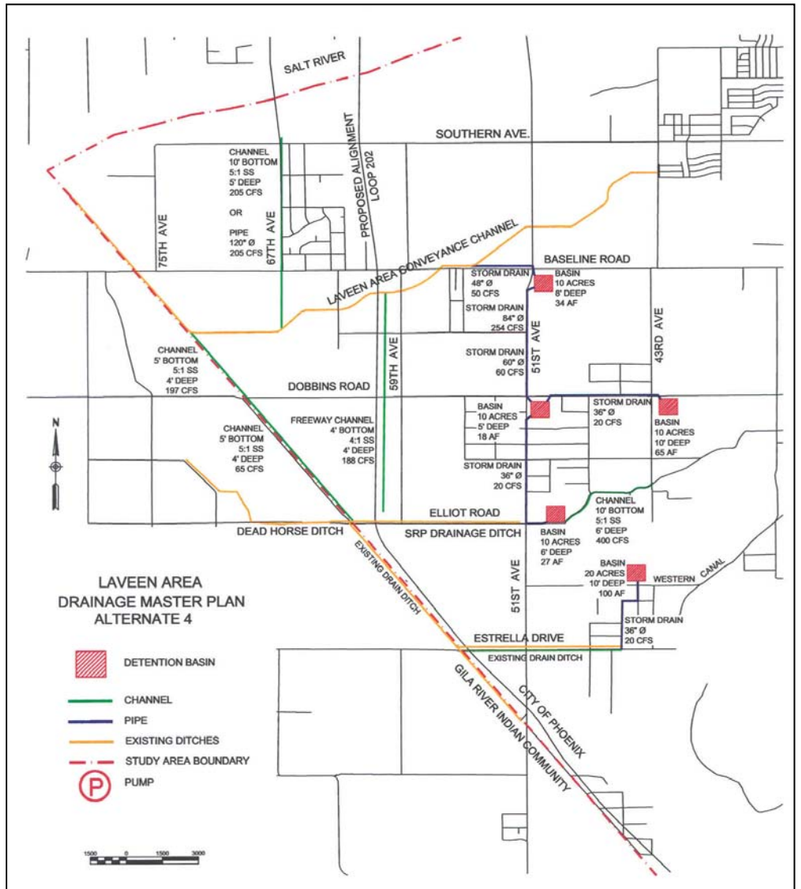



Figure 4-42: Alternative 4, "Storm Drain Concept"

- Multiple-use channels are provided for the Western Canal and for Telegraph Pass.

- Western Canal flows are collected in a detention basin at 43rd Avenue, then conveyed west in a channel to the GRIC boundary, outfalling across the reservation.

- Several detention basins will be located in the existing Laveen area to collect flows and to reduce peak discharges before entering the storm drain system.

- Storm drains are proposed to run north along 51st Avenue to the Laveen Area Conveyance Channel and west along Dobbins Road to the proposed Loop 202 Transportation corridor.

- The Telegraph Pass channel is conveyed west to the Gila River Indian Reservation.

- South Mountain watershed flows are collected in a detention basin and channeled west or south through the reservation to the Gila River.

- The Western Canal channel runs west to Estrella Drive and then piped north to the Laveen Area Conveyance Channel.

- A storm drain along 67th Avenue takes flows north to the Salt River or south to the Laveen Area Conveyance Channel.

*Engineering Considerations*

A detention basin is proposed at the intersection of 43rd Avenue and Dobbins Road. The basin has a top area of 10 acres, a bottom area of 3.1 acres, and is 10 feet deep with 5:1 side slopes. This basin will have a metered outflow, not exceeding 20 cfs, to a storm drain in Dobbins Road. The storm drain from 43rd Avenue to 51st Avenue will have an inside diameter of 36 inches. The storm drain will discharge to a detention basin at 51st Avenue and Dobbins Road.

The detention basin at 51st Avenue and Dobbins Road has a top area of 10 acres and a 4-acre bottom area. It is 5 feet deep with 5:1 side slopes.

Another detention basin is located west of the intersection of Elliot Road and 47th Avenue. A channel along the SRP lateral is used as a collector facility and outlets to this detention basin. The basin has a 10-acre top area and a 3.8-acre bottom area. It is 6 feet deep with 5:1 side slopes. The channel that feeds into the basin has a 10-foot wide bottom and 5:1 side slopes. It will have the capacity to carry 400 cfs and flows at a depth of 6 feet.

The detention basin west of 47th Avenue and Elliot Road will outfall to the detention basin at 51st Avenue and Dobbins by way of a storm drain with an inside diameter of 36 inches. The storm drain will have a metered flow rate of 20 cfs.

Flows outfalling the detention basin at 51st Avenue and Dobbins will be conveyed north to a detention basin at 51st Avenue and Baseline

Road. The storm drain connecting the two detention basins will have an inside diameter of 84 inches and have a capacity of 254 cfs.

The detention basin at 51st Avenue and Baseline Road will have a top area of 10 acres and a 3.4-acre bottom. It will be 8 feet deep with 5:1 side slopes. This detention basin will be located approximately one-half mile from the Laveen Area Conveyance Channel and will ultimately outfall to that facility. The outfall will be metered by a 48 inch inside diameter storm drain.

Flows that currently collect and inundate 67th Avenue will be directed to a drainage channel that will flow south, parallel to 67th Avenue, from Southern Avenue to the Laveen Area Conveyance Channel. The 67th Avenue Channel will have a bottom width of 10 feet and side slopes of 5:1. The channel will flow at a depth of 5 feet and have a capacity of 205 cfs.

A 20-acre detention basin will be located on the north side of Carver Road, at a wash just west of the Western Canal, to collect flows at that point. The basin will have a volume of 100 acre-feet and be approximately 10 feet deep. The basin will outlet south to 47th Avenue and Estrella Drive in a storm drain 36 inches in diameter at a flow rate of 20 cfs. The storm drain outfalls to an existing SRP drainage ditch that heads directly west along Estrella Drive.

This alternative provides for a drainage channel east of the future Loop 202 Transportation corridor from Elliot Road north to the Laveen Area Conveyance Channel. This is a collector channel that will intercept east to west flows, protecting lands downstream of the transportation corridor alignment. The channel has a bottom width of 4 feet, with 4:1 side slopes and flows at a depth of 4 feet. Channel capacity is 188 cfs.

Another drainage channel will flow diagonally along the boundary with the Gila River Indian Reservation from Elliot Road northwest to were it will intersect with the Laveen Area Conveyance Channel, at approximately the extension of Olney Avenue. This channel will have bottom width of 5 feet and side slopes of 5:1. Depth of flow will be 4 feet and the flow rate will be 197 cfs.

*Environmental Considerations*

A diverse range of cultural resources, from prehistoric villages and canals to historic buildings and roads, are located within the Laveen ADMP project area. As previously described in Part 2, only about 23% of the ADMP area has been evaluated in recent, intense cultural resource survey. Therefore, all of the alternatives have the potential to impact cultural resources, especially in agricultural fields and under roads where subsurface disturbances have been limited to only a few feet. As with each of the alternatives, additional archeological surveys of the area will be expected.

Because of the mostly agricultural nature of activity in the area, there is a relatively small concentration of potential hazardous material sites throughout any of the alternatives. Underground storage tanks are located at several of the major intersections throughout the downtown Laveen area. Only one leaking underground storage tank is located in an area that may conflict with the project at 51st Avenue and Dobbins Road. This site is likely to affect all three alternatives equally.

Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*, directs that programs, policies, and activities not have a disproportionately high and adverse human health and environmental effect on minority and low-income populations. The population in Laveen is comprised of low-income and minority persons. The goal of this project is to improve flood conditions for businesses and residences in the Laveen area. The alternative has the potential to displace residents depending on the final location of the proposed drainage basins. Locations of the basins were determined by creating the best solution based on current, past, and future flooding problems. Therefore, the project is not anticipated to have a disproportionately high or adverse impact on low-income or minority populations. This project is expected to benefit Laveen residents by providing increased flood protection to the area and increasing recreational opportunities by providing multi-use paths.

Because a significant portion of this alternative is below ground, i.e. in storm drains, the opportunity for supporting wildlife habitat by creating corridors in linear easements is somewhat limited. This alternative does however provide for large open spaces in the system of detention basins. A portion of the basins may be designed to promote wildlife, either by serving as habitat or interpretive centers.

*Multi-use Opportunities*

This alternative focuses on pipes and basins. Because pipes would be underground, this alternative does little to support the implementation of the Laveen Watercourse Plan or trails proposed in the Phoenix General Plan. Basins, located along 51st Avenue at Baseline and Dobbins Roads, at 43rd Avenue and Dobbins Road and at approximately 43rd Avenue and Carver Road provide opportunities for open spaces without connections to the wider planned trail system. Another basin, located along Elliot Road could be integrated into the General Plan and Laveen Watercourse Plan trail system. Landscaped channels between Elliot Road and the Laveen Area Conveyance Channel, the Laveen Area Conveyance Channel and the Salt River and along the Gila River Indian Community border provide connections between the planned Baseline/Dobbins Scenic Drive and the Salt River.

*Planned Landscape Character Scheme*

All but one basin in this alternative is located in the agriculture landscape character area, and would be designed with an agricultural theme. This theme envisions basins as nodes with passive open space and linear trail connections. Similarly, the channels between the Laveen Area Conveyance Channel and Elliot Road would be designed to an agricultural theme. The proposed channels along Estrella Drive and Elliot Road are associated with a natural desert theme, and the Channel along 67th Avenue north of the Laveen Area Conveyance Channel is associated with a transitional theme.

*Advantages*

- Very little right-of-way is required for conveyance system.
- Provides opportunities for open spaces.
- Provides some north-south trail connections.

*Disadvantages*

- Does not protect the Gila River Indian Community.
- Does not provide for wildlife habitat or corridors.
- Does not implement the Laveen Watercourse, Town Core, Baseline/Dobbins Scenic Drive or Phoenix General Plan.
- Does not provide linkages for open space/recreation opportunities associated with basins.
- Basin locations may not be coincident with the preferred locations for parks.

*Constraints*

- Coordination required with ADOT for the proposed Loop 202 Transportation corridor channel.
- Does not take into account the planned Laveen Core area

***Alternative 6***

*Estimated Cost*

Alternative 6 estimated cost = $21,485,345. Additional costs may be incurred with the incorporation of multi-use infrastructure, which would be funded by organizations other than the District. Refer to Table 15 for a detailed explanation of the estimated costs.

*Description*

- Alternative 6 is similar to the Alternative 6 described in Part 3 of this report, described as the "Minimal Structural" alternative. It has been refined slightly to allow for practical hydrologic and hydraulic considerations. It provides for the least amount of infrastructure necessary to provide 100-year flood protection and minimizes the possibilities for recreation and shared use facilities that could be provided in combination with flood control improvements. Minor flooding is not addressed and opportunities for multiple uses within the flood control solutions are minimized. Features of this alternative include:

- A collector channel is placed behind the Western Canal to capture and convey flows to basins near 43rd and 47th Avenues to protect 43rd to 51st Avenue flooding areas.
- Storm drains placed within the Laveen Core convey flows to 51st Avenue, then ultimately to the Laveen Area Conveyance Channel to protect the Laveen Elementary School as well as existing Laveen.
- A basin at 51st Avenue and Baseline Road is planned to detain flows and reduce peak discharges into the Laveen Area Conveyance Channel.
- Storm flows from along Telegraph Pass will be collected and conveyed via a channel to a detention basin, then outfall west into existing Dead Horse Ditch

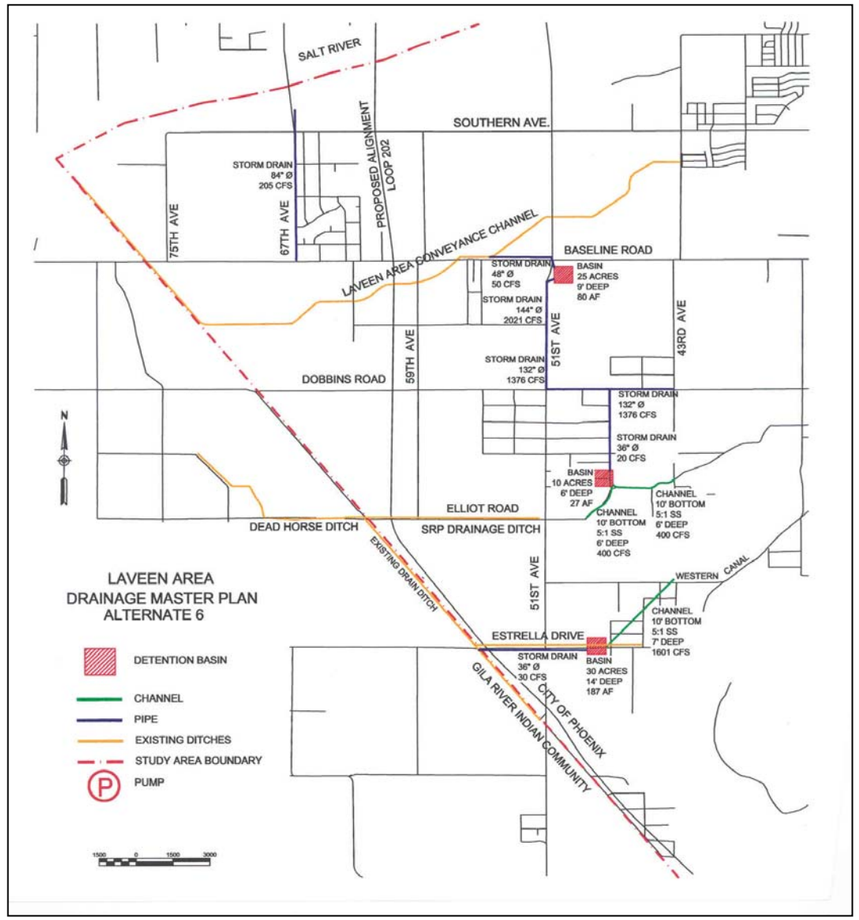



Figure 4-43: Aternative 4, "Storm Drain Concept

- The possibilities for recreation and other multi-use opportunities, in combination with flood control improvements are minimized.

*Engineering Considerations*

A storm drain is proposed starting at the intersection of 43rd Avenue and Dobbins Road. The storm drain will have a capacity of 1376 cfs, and an inside diameter of 132 inches. The storm drain will flow west to 51st Avenue and Dobbins. From there, the storm drain turns north along 51st Avenue to a detention basin at the intersection of 51st Avenue and Baseline Road. The storm drain along this reach has an inside diameter of 144 inches and a flow capacity of 2021 cfs.

The addition of a detention basin(s) at 43rd Avenue and Dobbins, or increasing the size of the detention basin at 51st Avenue and Dobbins will greatly reduce the stated sizes for the storm drains.

The detention basin at 51st Avenue and Baseline Road will have a top area of 25 acres and a 3.3-acre bottom. It will be 9 feet deep with 5:1 side slopes. This detention basin will be located approximately one-half mile from the Laveen Area Conveyance Channel and will ultimately outfall to that facility. The outfall will be metered by a 48 inch inside diameter storm drain with a flow rate of 50 cfs.

Another detention basin is located at the intersection of Elliot Road and 47th Avenue. A channel along the SRP lateral is used as a collector facility and outlets to this detention basin. The basin has a 10-acre top area and a 3.8-acre bottom area. It is 6 feet deep with 5:1 side slopes. The channel that feeds into basin has a 10-foot wide bottom and 5:1 side slopes. It will have the capacity to carry 400 cfs and flows at a depth of 6 feet.

The detention basin at 47th Avenue and Elliot Road will outfall to the storm drain in Dobbins Road a storm drain in 47th Avenue. The storm drain has an inside diameter of 36 inches. The storm drain will have a metered flow rate of 20 cfs.

Flows that currently collect and inundate 67th Avenue will be directed to the Salt River in a storm drain that will flow north, parallel to 67th Avenue, from Baseline Road to north of Southern Avenue. The 67th Avenue storm drain will have an inside diameter of 84 inches and have a capacity of 205 cfs.

A drainage channel will be located from Carver Road, southwest along a wash to Estrella Drive, to collect and control flows. The channel will have a bottom width of 10 feet, with 5 to 1 side slopes. The channel will flow 7 feet deep and have a capacity of 1600 cfs. The channel will flow into a detention basin at approximately 47th Avenue and Estrella Drive.

The detention basin at 47th Avenue and Estrella Drive will have a volume of 187 acre-feet and be approximately 14 feet deep. It has a top area of 30 acres and a bottom area of 2.45 acres. The detention basin will outlet west to a storm drain in Estrella Drive. The storm drain is 36 inches in diameter and has a flow rate of 30 cfs. The storm drain ultimately discharges to an existing SRP drainage ditch that heads directly west along Estrella Drive.

*Environmental Considerations*
A diverse range of cultural resources, from prehistoric villages and canals to historic buildings and roads, are located within the Laveen ADMP project area. As previously described in Part 2, only about 23% of the ADMP area has been evaluated in recent, intense cultural resource survey. Therefore, all of the alternatives have the potential to impact cultural resources, especially in agricultural fields and under roads where subsurface disturbances have been limited to only a few feet. As with each of the alternatives, additional archeological surveys of the area will be expected.

Because of the mostly agricultural nature of activity in the area, there is a relatively small concentration of potential hazardous material sites throughout any of the alternatives. Underground storage tanks are located at several of the major intersections throughout the downtown Laveen area. Only one leaking underground storage tank is located in an area that may conflict with the project at 51st Avenue and Dobbins. This site is likely to affect all three alternatives equally.

Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*, directs that programs, policies, and activities not have a disproportionately high and adverse human health and environmental effect on minority and low-income populations. The population in Laveen is comprised of low-income and minority persons. The goal of this project is to improve flood conditions for businesses and residences in the Laveen area. The alternative has the potential to displace residents depending on the final location of the proposed drainage basins. Locations of the basins were determined by creating the best solution based on current, past, and future flooding problems. Therefore, the project is not anticipated to have a disproportionately high or adverse impact on low-income or minority populations. This project is expected to benefit Laveen residents by providing increased flood protection to the area and increasing recreational opportunities by providing multi-use paths.

Because a significant portion of this alternative is below ground, i.e. in storm drains, the opportunity for supporting wildlife habitat by creating corridors in linear easements is somewhat limited. This alternative does however provide for large open spaces in the system of detention basins. A portion of the basins may be designed to promote wildlife, either by serving as habitat or interpretive centers.

*Multi-use Opportunities*
Because this alternative uses the least amount of intervention to manage stormwater, it also offers the fewest opportunities for recreation associated with stormwater management facilities. Detention basins at 51st Avenue and Baseline Road, Elliot Road and and 47th Avenue, and Estrella Drive and 43rd Avenue offer open space opportunities associated with trails planned along the Laveen Area Conveyance Channel, Lateral 14, and the Telegraph Pass Canals. This alternative does not contribute to the implementation of the Laveen Watercourse, Town Core, South Mountain Trails, or Baseline/Dobbins Scenic Drive plans.

*Planned Landscape Character Scheme*
The majority of the landscape character associated with this theme is associated with detention basins. Natural re-vegetation is recommended along channels at Elliot Road and Estrella Drive.

*Advantages*
- Minimum maintenance efforts required.
- Minimum amount of new right-of-way required.
- Minimum disturbance to the existing landscapes.

*Disadvantages*
- Very large diameter storm drains are required.
- Does not provide for trail connections.
- Does not provide for wildlife habitat or corridors.
- Does not contribute to the implementation of existing plans.
- Does not provide connections between South Mountain and Salt River.
- Does not provide flood protection for Gila River Indian Community.

*Constraints*
- Does not take into account the planned Laveen Core area.

## EVALUATION OF ALTERNATIVES

Each of the three alternatives has been evaluated with respect to the specific criteria discussed below. The results of the evaluation process have yielded the preferred alternative that will be carried forth to conceptual level design.

### *Method of Evaluation*

A four-step method of evaluating the alternatives was developed. In order to evaluate the alternatives objectively, the methodology was carefully designed to allow fair and open participation among the evaluators.

The four basic steps are:

- Determine who are to be the evaluators, and what weight will be given to their respective evaluation scores.
- Determine the evaluation criteria for the alternatives, and what weight will be given for each criteria.
- Rate how each alternative measures against the criteria, and
- Summarize and present the results.

### *Evaluators*

In order to include as many voices in the evaluation process as possible, the study team members have listed the stakeholders and ranked them into tiers based on their level of involvement or interest in the study. The areas considered include financial, quality of life, and public safety. Financial interests include primarily those stakeholders viewed as funding partners. Quality of life relates to those who will live with the long-term results of the alternative, and public safety involves those who are charged with the ongoing and continued success of the alternative. Following, is a table that illustrates and summarizes this analysis.

Table 13: Stakeholder tiers ranking system

| TIER 1 | TIER 2 |
|---|---|
| Laveen Residents | MCDOT |
| City of Phoenix | ADOT |
| SRP | GRIC |
| FCDMC | |

### *Evaluation Criteria*

The evaluation criteria have been defined based upon the goals and objectives established for the Laveen ADMP at the Alternatives Formulation meeting held February 1st, 2001. Weights have been applied to the significance of each criteria, by comparing the preferences of the various stakeholders. The study team members in individual stakeholder meetings undertook the effort to solicit and compare criteria preferences. The following discusses the criteria used to evaluate the alternatives:

*Capital Cost*
Capital cost is the initial cost of the project. This cost considers construction equipment, materials and labor, right-of-way acquisition and site mitigation, utility protection and relocation, design engineering, and contingencies including permitting and other miscellaneous costs. Costs related to ongoing operation and maintenance are not addressed here, but are discussed under maintenance criteria. Because the capital cost of each alternative is being compared relative to the other alternatives, it is not necessary to estimate future construction costs. Present day unit costs have been used based upon recent bid tabulations for large projects in the Phoenix metropolitan area.

A score of plus one is assigned to the alternative with the lowest capital cost. A score of minus is assigned to the alternative with the highest first cost. The remaining alternative receives a score of zero.

*Multiple-Use Opportunities*
The alternative that would create the most multi-use opportunities, provide for recreational amenities, develop links between public transportation facilities and routes, and benefits adjacent property owners the most is assigned a score of plus one. A score of minus one is given to the alternative with the fewest multi-use opportunities, limited recreation amenities, lacks the potential to link public transportation facilities and routes, requires substantial relocation of residences, and/or negatively affects adjacent property owners.

*Acceptability to Local Residents*
The acceptability of a flood control project by the residents, landowners, and developers is important to the overall success of the project. A score of plus one is assigned to the alternative that would be most acceptable to the public in terms of land acquisitions, visual quality, recreational benefit, and overall flood protection. A score of minus one is assigned to the alternative that would be least acceptable to the public.

*Acceptability to Public Agencies*
Similar to the above criteria, the acceptability of a flood control alternative by the public agencies charged with constructing, operating, and maintaining the facility, both from a storm drainage master planning point of view and from a multi-use opportunity point of view is essential to a successful project. A score of plus one is assigned to the alternative that is most acceptable to public agencies. A score of minus one is assigned to the alternative with the most public agency resistance.

*Environmental Impacts*
These environmental considerations refer to the potential impacts to areas of high habitat value, high historic and cultural value, and wildlife opportunities. A score of plus one is assigned to the alternative(s) that will protect areas of high habitat or historic value and provide for the opportunity to enhance and/or create habitat. A score of minus one would be assigned to the alternative having the most negative impacts on the physical, natural, and cultural considerations, and provide the fewest opportunities to enhance wildlife.

*Maintenance*
Maintenance refers to the annual cost for maintaining and operating the flood control facility. Frequency of maintenance and difficulty of access affect annual maintenance costs. A score of plus is assigned to projects with the lowest maintenance cost. A score of minus one is assigned to projects with the highest annual maintenance cost.

*Implementation*
Opportunities to partner with an agency such as ADOT, the city of Phoenix, MCDOT, GRIC or SRP are beneficial to both the District and the partnering agency. Initial costs as well as annual maintenance can be shared, and the community realizes long-term benefits to both flood control and to the recreational aspects of the facilities. A score of plus one is assigned to the alternative with the best opportunity for partnering and cost sharing. A score of minus one is assigned to the alternative with the least opportunity for partnering and cost sharing.

*Appropriate to Landscape*
This criteria refers to the opportunity to either preserve existing desirable landscape character or improve the aesthetics and visual character of the study area. A score of plus one is assigned to the alternative that will provide for the greatest opportunity to enhance aesthetics. A score of minus one would have the most negative

impacts on the physical and natural considerations, and provide the fewest opportunities to enhance aesthetics.

*Evaluation Matrix*

The evaluation matrices in Figures 4-43 and 4-44 show the weights of the evaluation criteria and the resulting ranks of the three alternatives. Blank copies of Figure 4-43 were distributed to the stakeholders at individual meetings. Each person representing a stakeholder group or entity completed these forms to determine the preferred alternative for their group.

The weight values for each criterion were determined by comparing each criterion against each other. Each one of the criteria on the first column was compared to each of those listed on the first row. If the evaluator favored one aspect over the other, a "+" was assigned. No preference of one over the other, was assigned a "0", while a "-" was assigned for less preference of one over the other. A numerical value corresponding to each symbol was utilized to calculate a weighted multiplier used in the evaluation of alternatives for each stakeholder group.

| | | A | B | C | D | E | F | G | H | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Capital Cost | Multi-Use Opportunities | Acceptability to Local Residents | Acceptability to Public Agenicies | Environmental Impacts | Maintenance | Implementation | Appropriate to Landscape | Weights |
| A | Capital Cost | | + | - | 0 | 0 | + | - | 0 | **0.19** |
| B | Multi-Use Opportunities | | | 0 | - | 0 | + | - | + | **0.17** |
| C | Acceptability to Local Residents | | | | 0 | - | 0 | - | - | **0.12** |
| D | Acceptability to Public Agencies | | | | | 0 | + | 0 | + | **0.16** |
| E | Environmental Impacts | | | | | | + | - | + | **0.13** |
| F | Maintenance | | | | | | | - | + | **0.08** |
| G | Implementation | | | | | | | | + | **0.12** |
| H | Appropriate to Landscape | | | | | | | | | **0.04** |

+ = Strong Preference
0 = No preference
- = Less Preference

Figure 4-44: Criteria Evaluation Matrix

Based on the stakeholders' level of involvement, or tier, their selected alternative was multiplied by a "stakeholder tier factor". This factor was previously calculated by evaluating the stakeholders with each other using the same procedure that was utilized in the evaluation criteria comparison. The total scores were summed and the alternative receiving the highest score was selected as the preferred alternative.

The evaluations have been performed at individual review meetings with the stakeholder groups. At the meetings, an overview of the three screened alternatives and the evaluation process was presented. Opportunity was provided for questions and discussion. Following the discussion, the evaluation forms were completed. The scores were tabulated with the aid of a laptop.

| | | | Alt 2A | Alt 4 | Alt 6 |
|---|---|---|---|---|---|
| A | Capital Cost | Rank | | | |
| | | Weight | 0.19 | 0.19 | 0.19 |
| | | Score | 0 | 0 | 0 |
| B | Multi-Use Opportunities | Rank | | | |
| | | Weight | 0.17 | 0.17 | 0.17 |
| | | Score | 0 | 0 | 0 |
| D | Acceptability to Local Residents | Rank | | | |
| | | Weight | 0.12 | 0.12 | 0.12 |
| | | Score | 0 | 0 | 0 |
| E | Environmental Impacts | Rank | | | |
| | | Weight | 0.16 | 0.16 | 0.16 |
| | | Score | 0 | 0 | 0 |
| F | Maintenance | Rank | | | |
| | | Weight | 0.13 | 0.13 | 0.13 |
| | | Score | 0 | 0 | 0 |
| G | Implementation | Rank | | | |
| | | Weight | 0.08 | 0.08 | 0.08 |
| | | Score | 0 | 0 | 0 |
| H | Appropriate to Landscape | Rank | | | |
| | | Weight | 0.12 | 0.12 | 0.12 |
| | | Score | 0 | 0 | 0 |
| | | Total Score | 0 | 0 | 0 |
| | | Weighted Totals | **#DIV/0!** | **#DIV/0!** | **#DIV/0!** |

Rank
+1 = Most prefereable for selected criteria
0 = Preferable
-1 = Least prefereable for selected criteria

Figure 4-45: Alternatives Evaluation Matrix

Table 14: Detailed Costs - Alternative 2A

Figure 4-46: Engineering Plan – Alternative 2A

Figure 4-47: Landscape Plan – Alternative 2A

Table 15: Detailed Costs – Alternative 4

Figure 4-48: Engineering Plan – Alternative 4

Figure 4-49: Landscape Plan – Alternative 4

Table 16: Detailed Costs – Alternative 6

Figure 4-50: Engineering Plan – Alternative 6

Figure 4-51: Landscape Plan – Alternative 6

## PART 5. RECOMMENDED PLAN

Based on input from a series of Stakeholder Meetings as well as input received during the Laveen ADMP Public Meeting #4, (Figure 5-1) the recommended plan for Laveen was developed. The plan takes into account the most favorable components of the previous alternatives and incorporates them into a feasible design that will provide flood protection, multiple use opportunities, and is acceptable to the Laveen residents.

Figure 5-1: Laveen Public Meeting #4

Individual Stakeholder meetings were held with representatives from City of Phoenix, Flood Control District of Maricopa County, and citizen groups residing in Laveen on separate occasions. The most influential criteria resulting from the meetings were "Acceptability to Local Residents" and "Multiple-use Opportunities". All other criteria were still viewed as important, but it was these two factors that would determine whether the recommended plan would be acceptable.

The alternative that provided for the greatest amount of multiple-use opportunities was Alternative 2A. In order to make this alternative more appealing to residents and meet the criterion of acceptability, it was necessary to modify it and incorporate elements of the other two alternatives. The recommended plan, thus evolved from the existing Alternatives 2A, 4, and 6.

At the fourth Public Meeting, held on October 1, 2001, the recommended plan was presented to the public. An overview of the ADMP process and how the plan was developed was presented at a formal presentation. Participants were allowed to ask questions and provide suggestions or feedback based on their experiences and concerns. During the meeting, some comments were addressed regarding location of certain features presented in the plan and how those would affect existing properties. It was pointed out that the recommended plan does not specify concrete locations and that as part of the next step, and the design process, specific locations and alignments would have to be carefully evaluated and identified.

The recommended plan consists of a combined system of detention basins, channels, and storm drains. The features of the recommended plan include:

- Detention basins will located along 51st Avenue on Baseline, Dobbins, and Elliot Roads. Additional basins will be located near the Cheatum property at 49th Avenue and Elliot Road, at 43rd Avenue and Dobbins Road, and at 44th Avenue and Carver Road.
- Multiple-use channels along SRP's existing Western Canal and along 67th Avenue from Vineyard Avenue to the Laveen Area Conveyance Channel.
- Storm drains located along Elliot Road from 49th Ave to 51st Avenue, along 51st Avenue connecting the proposed detention basins, and along Baseline Road from the 51st Avenue basin to the Laveen Area Conveyance Channel, and a storm drain from Carver Road Basin south to Estrella Drive.

By combining these elements, the recommended plan will achieve specific goals identified throughout the ADMP process. The particular goals achieved by this plan are:

- Implementation of the 51st Avenue Scenic Drive concept of the Southwest Growth Study.
- Implementation of the General Plan Laveen Trails.
- Incorporation of additional opportunities for development of city parks through the use of detention basins.

Figure 5-2: Recommended Plan

- The addition of a trailhead connecting the Rio Salado project at 67th Avenue.
- Connections of the trail system planned along the Laveen Area Conveyance Channel.
- Alignment of trails, to the greatest extent possible, with existing or planned rights-of-way.

## ESTIMATED COST

The engineer's estimated cost of the Recommended Plan is shown in Table 16. It is important to note that a 30% contingency is included in the estimate, to allow for unknown items.

## ENGINEERING CONSIDERATIONS

The cost for this alternative is approximately $22 million. Detailed description of each feature is provided in Table 16.

The detention basin located at the intersection of 43rd Avenue and Dobbins has a top area of 10 acres, a bottom area of 7.2 acres, and is 10 feet deep with 5:1 side slopes. This basin will have a metered outflow, not exceeding 20 cfs, to a storm drain in Dobbins Road. The storm drain running from 43rd Avenue to 51st Avenue will have an inside diameter of 36 inches. It will discharge to a detention basin at 51st Avenue and Dobbins. This detention basin has a top area of 10 acres and a 8.5-acre bottom area. It is 5 feet deep with 5:1 side slopes.

Another detention basin is located west of the intersection of Elliot Road and 49th Avenue. A channel along the SRP lateral is used as a collector facility and outlets to this detention basin. The basin has a 10-acre top area and an 8.3-acre bottom area. It is 6 feet deep with 5:1 side slopes. The channel that feeds into the basin has a 20-foot wide bottom and 5:1 side slopes. It will have the capacity to carry 777 cfs and flows at a depth of 4.2 feet. The detention basin will connect to the detention basin at 51st Avenue and Dobbins by way of a storm drain with an inside diameter of 36 inches. The storm drain will have a metered flow rate of 20 cfs.

Flows outfalling the detention basin at 51st Avenue and Dobbins will be conveyed north to detention basin at 51st Avenue and Baseline Road. The storm drain connecting the two detention basins will initially have an inside diameter of 48 inches and have a capacity of 60 cfs. At South Mountain Boulevard, the storm drain changes size to 84 inches diameter and has a capacity of 299 cfs.

The detention basin at 51st Avenue and Baseline Road will have a top area of 10 acres and a 7.7-acre bottom. It will be 8 feet deep with 5:1 side slopes. This detention basin will be located approximately one-half mile east of the Laveen Area Conveyance Channel and will ultimately outfall to that facility. The outfall will be metered by a 48 inch inside diameter storm drain.

Flows that currently collect and inundate 67th Avenue will be directed away by two separate facilities. A drainage channel will flow south, parallel to 67th Avenue, and a storm drain will flow north to the Salt River. The 67th Avenue Channel will flow from Vineyard Avenue and ultimately outflow to the Laveen Area Conveyance Channel. The channel will have a bottom width of 10 feet and side slopes of 5:1. The channel will flow at a depth of 1.7 feet and have a capacity of 59 cfs. The 66-inch storm drain will begin just north of Vineyard Avenue and will flow at a rate of 137 cfs.

A 20-acre detention basin will be located on the north side of Carver Road, near 44th Avenue, to collect flows at that point. The basin will have a top area of 20 acres and be approximately 10 feet deep. The basin will outlet south to 47th Avenue and Estrella Drive in a storm drain 36 inches in diameter at a flow rate of 20 cfs. The storm drain outfalls to an existing SRP drainage ditch that heads directly west along Estrella Drive.

## ENVIRONMENTAL CONSIDERATIONS

Additional archaeological surveys of the area will be expected with the implementation of the recommended plan. As discussed in Section 2, approximately 23% of the study area has been evaluated in recent, intense archaeological research. Based on these previous surveys, a diverse range of cultural resources, from prehistoric villages and canals to historic buildings and roads, are located within the Laveen ADMP project area.

Because of the mostly agricultural nature of activity in the area, there is a relatively small concentration of potential hazardous material sites throughout any of the alternatives. Underground storage tanks are located at several of the major intersections throughout the downtown Laveen area. Only one leaking underground storage tank is located in an area that may conflict with the recommended plan at 51st Avenue and Dobbins Road.

The project is not anticipated to have a disproportionately high or adverse impact on low-income or minority populations. Locations of the basins were determined by creating the best solution based on current, past, and future flooding problems. This project is expected to benefit Laveen residents by providing increased flood protection to the area -and increasing recreational opportunities by providing multi-use paths.
The recommended plan provides for large open spaces in the system of detention basins. A portion of the basins may be designed to promote wildlife, either by serving as habitat or interpretive centers. The connectivity achieved by the trail systems may provide for wildlife corridors and connections between the South Mountain Park and Salt River ecosystems.

## MULTI-USE OPPORTUNITIES

Four landscape character areas were identified in the Master Plan: Natural, Transitional, Agricultural and Urban. The proposed Master Plan (Figure 5-4) includes trails and detention basins that could be incorporated into park sites in all of these areas. Prototypical design for these features is described below. To meet the City of Phoenix minimum size criteria for neighborhood parks, these facilities will be augmented by tot lots, open play areas and parking.

The recommendation includes trails within the Drainage Master Plan pipe easements along 51st Avenue, Dobbins Road and trails along the drainage channel recommended along 67th Avenue (Figure 5-3).

Figure 5-3: 67th Avenue Channel Cross-section

Figure 5-4: Recommended Landscape Master Plan

## URBAN LANDSCAPE

The urban landscapes in Laveen are mostly within the developed areas and include new and older subdivisions. Portions of the 51st Avenue Trail and two ten-acre detention basis are proposed within this landscape character area. To reflect the urban character of the area, the detention basin facilities could include developed play areas or sports field, surrounded by shaded areas and ramadas. A shared use trail could be provided to access the basin.

Through the use of indigenous and non-indegeous plants (see plant list on basin landscape plan sheet) and native inert surface treatment in the detention basin an "Urban Park" approach was developed. The cross slope and edges of the basin should be varied to aid in a softer feel to the site. A natural wash was also introduced into the bottom of the basin to help soften the geometric shape of the basin and also to help convey nuisance water. A turfed sports field area was also introduced into the basin for more active play activities. In the upper reach an open play turfed area and tot lot will be added to introduce more active recreation amenities into the park. A 6-foot shared-use trail will also loop throughout the site and provide a connection to the parking lot/ trailhead. The parking lot/ trailhead will also tie into the shared-use trail and equestrian path that parallels 51st Avenue and Baseline Road. Ramada's, area lights and other amenities will be provided to aid in the users experience and comfort.

Figure 5-5: Urban Landscape Character Theme basin at 51st Avenue and Baseline

The pipe easement along 51st Avenue, which the plan recommends be maintained for a trail, also reflects an urban landscape character design. The 51st Avenue Trail includes a minimum width of ten feet and landscaping compatible with surrounding development.

**Transitional Landscape**

Figure 5-6: Transitional Landscape Character Theme basin at 51st Avenue and Dobbins Road

The Transition area is generally located north of Southern Avenue, and includes the privately owned golf course between Southern Avenue and Baseline Road. The plan recommends a retention basin at the southwest corner of Dobbins and 51st Avenue. While the basin is within the urban area, it's location at the juncture of the storm drain on Dobbins Road and the pipe along 51st avenue provides an opportunity to offer a natural wash feature that could be active during small storms. Consequently, the design for this basin was developed using the transitional theme. Through the use of indigenous and non-indigenous plants (see plant list on basin landscape plan sheet) and native inert surface treatment in the detention basin a "Transitional Park" approach was developed.

The cross slope and edges of the basin should be varied to aid in a more "natural" feel to the site. A natural wash was also introduced into the bottom of the basin to help soften the geometric shape of the basin and also to help convey nuisance water. A turfed open play area was also introduced into the basin for more passive play activities. In the upper reach an open play turfed area and tot lot will be added to introduce more active recreation amenities into the park. A 6-foot shared-use trail will also loop throughout the site and provide a connection to the parking lot/ trailhead. The parking lot/ trailhead will also tie into the shared-use trail and equestrian path that parallels 51st Avenue. The 6-foot shared-use trail loop also ties into the Dobbins Road on street trail system that terminates at the new proposed Laveen Town Center. Ramada's, area lights and other amenities will be provided to aid in the users experience and comfort.

**Natural Desert Landscape**

The Natural Desert Area is recommended for the areas around South Mountain and Carver Hills. The plan proposes a basin at the Western Canal and Elliot Road. The design of this basin is intended to reflect the natural character of the undeveloped desert.

Figure 5-7: Natural Landscape Character Theme Basin at 47th Avenue and Elliot Road

Through the use of indigenous plant material (see plant list on basin landscape plan sheet) and native inert surface treatment in the detention basin a "Natural Desert Park" approach was developed.

The cross slope and edges of the basin should be varied to aid in a more "natural" feel to the site. A natural wash was also introduced into the bottom of the basin to help soften the geometric shape of the basin and also to help convey nuisance water.

**RECOMMENDED PLAN IMPLEMENTATION**

Successful implementation of the Area Drainage Master Plan will result after completion of several important elements:.

- ADOPT the Plan! First, the plan must be adopted by the all the stakeholders, as well as by decision-makers at the FCDMC, and embraced as the logical solution to local flood control.
- AGREE to Move Forward! An understanding an agreement by the stakeholders to move the plan forward is key to successful implementation.
- ALLOCATE the Funds! Funding of both the FCDMC portion of the plan, as well as elements of the plan requiring funding by various departments within the City of Phoenix and Maricopa County, and possible developer contributions need to be identified and set aside as soon as possible to move the plan forward.
- ACQUIRE the Land! Land for detention basin/park sites, channel drainage easements adjacent to existing rights-of-way, etc., need to be acquired before vacant land is developed or otherwise obligated.
- ADDRESS Critical Design Issues! Many design elements need to be worked out in detail to achieve a successful plan. In particular, phasing of construction in order to coincide with street widening, utility construction, and other improvement projects will greatly affect the cost, and therefore the success, of the plan.

It is imperative that the plan is well received and accepted by the major stakeholders early on. This will help expedite the process of securing the resources as they become available. Land acquisitions, purchase of parcels, shared easements, and even condemnations are a few of the ways that the FCDMC may begin to move forward with the implementation of the ADMP.

These decisions early on will reduce conflicts with developers, individual landowners and other important stakeholders as time progresses. In addition, by publishing and creating a document that sets aside the needed land for flood control, multiple entities can become aware and incorporate their plans to this ADMP, therefore facilitating partnering and cost sharing among various groups.

Table 17: Detailed Costs for Recommended Plan

Figure 5-8: Engineering Plan – Recommended Plan

**APPENDICES**

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|---|---|
| APPENDIX A: | Hydrologic Model: HEC-1 tree, input, portions of output |
| APPENDIX B: | Sub-basins for Laveen ADMP |
| APPENDIX C: | MCDOT Records of Reported Flooding |
| APPENDIX D: | Detailed Description of Listed Threatened and Endangered Species and Species of Concern for the Laveen ADMP Focus Area |
| APPENDIX E: | Copy of AGFD's Guidelines for Handling Sonoran Desert Tortoises Encountered on Development Projects |
| APPENDIX F: | HEC Model Output for Existing and Future Conditions, Alternative 2A, Alternative 4, and Alternative 6 |